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POLLUTANT LOADING OF URBAN AND RURAL AREAS IN SOUTHEASTERN NEW HAMPSHIRE

FINAL REPORT

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Pollutant Loading of Urban and Rural Areas in Southeastern New Hampshire

Abstract

This study was a pilot study of the highway maintenance practices of four New Hampshire communities and the loading rates of the non-point source pollutants. The communities selected included one urban community and four surrounding rural communities. The study was performed with a survey form and follow-up interviews. The objectives were to evaluate if there are significant differences between the practices and the loading rates of urban and rural communities. A second objective was to estimate the loading rates of various non-point source pollutants. The only potential pollutants found attributable to highway maintenance practices where sand and salt. Rural loading rates were estimated between 33 to 50 yd^3/mi for sand and 4.2 to 12 yd^3/mi for salt. The sand loading rates for the urban areas was significantly lower, with 7.5 yd^3/mi. The salt loading rate was within the same range as the rural communities surveyed. The general roadway maintenance procedures were very similar between each community surveyed.

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Final Report

The research detailed in this report is the first step or phase in a project conceived to identify those areas in the coastal region of New Hampshire which are the most sensitive to various types of non-point source pollution. The project is directed toward municipal maintenance programs; looking at non-point source pollutants distributed along the municipal highway systems as part of the standard maintenance practices. The first phase of this project was to identify the kinds of non-point source pollutants distributed, and to quantify the loading to the environment on an areal basis. The project did not deal with pollutants resulting from roadway traffic.

I. Overall Concept

The ultimate objective of the overall project is to identify the areas in the coastal region of New Hampshire which are the most sensitive to non-point source pollution from various selected pollutants. Once identified, those sensitive areas can be compared to pollutant loading information to create visual maps identifying the loading in sensitive areas. The maps and study results would be useful as a tool in prioritizing and identifying the most appropriate remedial measures for a particular pollutant. The end result will be the most effective use of the municipalities' remedial dollars.

The first phase of the project was to develop a pollutant loading data base based on surveys sent out to local municipalities and interviews with local township maintenance departments. The data base may serve as the basis for creating loading maps generated by hand or by combining the survey data with a geographical information system (GIS) data base. This first phase was funded by in part by a grant from the Office of State Planning, New Hampshire Coastal Program, as authorized by the National

Oceanic and Atmospheric Administration (NOAA), Grant Award Number NA57OZ0320. The findings of this first phase are described in the body of this report.

The second phase of the overall project would be to utilize a computer model, such as DRASTIC, to interface with a GIS data base to identify areas of highest pollution sensitivity or risk. DRASTIC formulates this information using the GIS data for each location in the data base and establishing a weighted value for the pollution risk for that location. This weighted value may include parameters such as land use, soil type, vegetative cover, depth to groundwater, hydraulic conductivity, surface slope, proximity to surface waters, etc. Weights for the each parameter are established with respect to the individual pollutant characteristics and the sensitivity of the parameter to that pollutant. The final risk is the summation of the product of the relative risk that the parameter contributes to the pollution potential, and the degree of the risk held by that particular location for each parameter. The model will compile these risk values for all locations in the selected area. The ultimate product is a detailed map identifying the degrees of risk based on a pre-selected scale of risk values. This map will identify the areas most sensitive to particular pollutants. The model may be reformulated for different pollutants.

The third phase of the project is to overlay the maps from the first two phases and identify the locations at which there may be a need for corrective action. Those locations at which remedial measures may decrease NPS pollution will be identified as well as the nature of the remedial measures required. This information in addition to the relative risk from the maps will aid in prioritizing the remedial projects.

II. Present Scope of Work

The scope of work for this report is a pilot study of the first phase, or the pollutant loading mapping. The pollutant mapping was based on information collected from four local municipalities, on activities which may either directly or indirectly contribute to non-point source pollution. These activities include salting and sanding the roads; street sweeping; use of dust palliatives; agri-chemicals; maintenance of bridges and runoff control structures; and construction best management practices (BHPs). Information on these activities were gathered through surveys sent directly to the municipalities and their maintenance departments, as well as

personal interviews with the persons in charge of operations that may affect non-point source pollution.

The specific tasks performed as part of this study included:

A. Selection of study area,

B. Designing a survey,

C. Formulating an interview procedure,

D. Sending out surveys,

E. Setting up and conducting interviews to supplement survey information,

F. Compiling the information gathered in a data base,

G. Preparation of final summary report.

The information gathered was evaluated with respect to its value in identifying loading rates, and areal distribution of the pollutant loading. The procedures used in gathering the information were also evaluated with respect to future efforts in pollutant load mapping. and aid in the evaluation of immediate remedial needs. Lastly, this study evaluated the benefits of the gathered information, especially in light of the cost and effort required to obtain it.

III. Methodology

The methodology used in this study is described below Reference is made to the specific tasks outlined in the introduction.

A. Selection of Study Area: The first task of this project was to select pilot study area. The objective was to examine at least two communities of different demographics, to see if there was a difference in the type of information which could be obtained. An urban community and a rural community in the same general area were desired. The pilot study area was selected in a meeting between the NHOSP, NHDES, UNH Technology Transfer Center, and the author. Dover, NH was selected as the urban area, since the information gathered in this study could potentially contribute to other on-going studies in that municipality. Three surrounding rural towns were selected because they were either adjacent to the town of Dover, or in the general area. The towns selected were Barrington, Rollinsford, and Farmington. Barrington and Rollinsford

are adjacent to Dover. Barrington is inland, while Rollinsford borders the Salmon Falls River which flows between New Hampshire and Maine. The locations of the selected towns are shown in Figure 1. Studying towns in the same vicinity reduced the influence of climate variables due to geographic location. The layout of the roads are shown in Figures 2 through 5 for Dover, Barrington, Rollinsford, and Farmington, respectively. The study concentrated only on those roads maintained by the municipalities, and ignored those practices along State or Federal Highways, such as the Spaulding Turnpike and Route 9 in Figure 2.

B. Designing a Survey: The first part of this task was to identify the type of information which would be useful in establishing pollutant loading rates, and the distribution of those rates along different sections of roadway. This task was initiated by examining other studies which have been done for highway maintenance practices. We obtained a report by the Office of the Legislative Auditor of the State of Minnesota of a review of the best practices for snow and ice control (Office of the Legislative Auditor ,1995). This document described the results of a detailed survey sent out to each municipality in the State of Minnesota requesting information on the current procedures and equipment used for snow and ice control and removal. The report was intended to provide a media for the exchange of information between municipalities in the state. Included in the report was the survey they sent out to the municipalities, and a tabulation of the results. We utilized this survey as the starting point for our own survey. We first selected those questions pertaining to the spreading of sand, salt, and any pre-wetting agents on the roads. The Minnesota survey was too detailed in many aspects of the snow plowing procedures for our own objectives, so many questions were either eliminated, combined, or simplified.

The Minnesota survey only addressed snow removal and traction control for icy conditions, and did not include questions on the other maintenance practices in which we were interested. We consequently added questions to the adapted Minnesota survey to solicit the type information which we were seeking on the other practices mentioned above. The draft of the survey was reviewed first by Mr. David Fluharty of the University of New Hampshire T^2 Center, and then by Marcia A. Brown-Thunberg and Jennifer Fox of the Office of State Planning of New Hampshire (NHOSP). Their comments were incorporated into the final survey. A copy of the final survey form is included in Appendix A.

The survey form was broken down into seven categories. They included:

I. Snow Removal and Traction Management,

II. Soil Stabilizers,

III. Bridge Maintenance Practices,

IV. Street Sweeping and Debris Removal,

V. Catch/Sediment Basin and Culvert Maintenance,

VI. Pesticide, Herbicide, and Fertilizer Application;

VII. Construction Practices.

Each category included questions on a particular type of non-point source pollutant. The potential pollutants addressed by each of the respective categories are:

I. Sand and salt;

II. Dust palliatives such as waste oil or liquid calcium chloride;

III. Bridge paint scale, rust, and sand blasting sand;

IV. Sand, dust and dirt, roadway residues from vehicles, and litter;

V. Sand, dirt, and organic material;

VI. Agri-chemicals such as pesticides, herbicides, and nutrients from fertilizers;

VI. Sand, dirt, organic matter, roadway residues, construction equipment residues, and other erosion materials.

The contaminants can be transported by means of surface water runoff, or through infiltration into the vadose zone and eventually to the groundwater table. Some the pollutants listed, such as sand, dirt, and organic matter are responsible for adding to the sediment load of surface waters, making waters more turbid and less suited to aquatic life. Road residues may contain petroleum based contaminants and heavy metals. Excess nutrients from fertilizers accelerate vegetative and alga growth in surface waters, and can make groundwaters unsuited for human consumption. Pesticides and herbicides can be transported to surface waters or groundwaters if the use is excessive, and can reach harmful concentrations for both aquatic life and human consumption.

C. Formulating an interview procedure: The draft survey was reviewed for questions which were best asked during an interview. Those questions were removed from the survey, and incorporated into an outline for the interview. This outline is shown in Appendix B.

The interview procedure as outlined above was altered slightly. It was decided since the final survey was so detailed, that it would be better to hold the interviews after the municipalities had time to review the survey and gather the information together, but before they returned the completed survey forms. The wisdom of this procedure was demonstrated by the fact that only one municipality had taken the time to fill out the survey form by the time of the interview. The interview procedure used was to go over the survey form questions, and incorporate the questions from the outline for the interview. This procedure worked well, with the interviewer filling out the survey form and making supplemental notes as the survey proceeded.

D. Sending out surveys: Before surveys were sent out, contact was made with the road agent or public works director of each of the four municipalities. The contacts were:

Dover: Mr. Michael Bobinsky, Public Works Director.
River Street
Dover, NH 03820
(603) 743-6070

Barrington: Mr. Ronald Landry, Road Agent.
99 Brooks Road
Barrington, NH 03825
(603) 664-5379

Rollinsford: Mr. Ronald Carignan
477 Silver Street
Rollinsford, NH 03869
(603) 742-0831

Farmington: Mr. Clark Hackett
Town Office
Farmington, NH 03835
(603) 755-4884

The purpose of our study was explained to each of the contacts above. The extent of the information sought was explained. In each case, a commitment to participate was obtained. For Dover, an initial interview was held with Mr. Bobinsky in which he agreed to

participate and outlined his department's procedures. Dover was the only municipality surveyed that had a written snow removal operational plan. Mr. Bobinsky provided a copy of the plan for our review. The survey was sent out shortly after the last contact was made.

E. **Conducting the interviews:** The interviews were conducted in person with all but Mr. Clark Hackett of Farmington. Due to conflicts with his work schedule, Mr. Hackett was interviewed by phone. The interviews were performed in May and early June. Supplemental material was provided by Mr. Bobinsky of Dover, regarding material usage and roadway management.

F. **Compile Information in a Database:** The information gathered in the surveys and interviews has been compiled on a single survey document, and is being entered into a data base. The data base being used is Microsoft© Visual Fox-Pro. The summary survey document is included in Appendix C. Comparisons were made between the urban and rural areas and are presented below. Data on the material usage, number of operations, priority routes, and the relative frequency of sanding were analyzed to estimate the loading rates of sand and salt to specific roads in the municipalities. Loading maps were prepared where appropriate, to indicate the areal extent of different calculated loading rates.

IV. Results

The four municipalities surveyed provided a cross-section of rural communities with populations from 2,600 (Rollinsford) to 6,700 (Barrington) and an urban population of 26,800. With reference to total land area, Barrington has the largest area, with approximately 49 $mi.^2$, followed by Farmington (37.4 $mi.^2$), Dover (24 $mi.^2$), and Rollinsford (7.5 $mi.^2$). Although it has only the third largest area, Dover has the most highway miles, with 125 miles of paved two-lane roads, 20 miles of unpaved roads, and 26.5 miles of State and Federal highways. Farmington has 66 miles of two lane paved town maintained roads, 22 miles of unpaved roads, and 15 miles of State highways. Barrington has 52 miles of paved two-lane roads, and 10 miles of gravel roads. Rollinsford, being the smallest town, has only 15 miles of Class V (rural, town maintained) roads.

A. **Summary of maintenance procedures.** Both Dover and Barrington have 27 cul-de-sacs and dead-ends. Farmington and

Rollinsford both have 16. These features are difficult to plow and sand with the same equipment used on the highways. In the case of each town, these features are plowed and sanded using a smaller, pick-up truck.

Dover has 10 bridges 10 feet or more in length, Barrington has 5, Rollinsford has 2 although one is owned by the railroad, and Farmington has 11. Bridges can be direct avenues for salt and sand and other sediments to enter surface waters. All the municipalities rely on state inspections of the bridges to evaluate their safety and rehabilitation requirements. In the rural communities, this inspection is done on a 2 year cycle, in Dover the bridges are inspected on an annual basis. Most of the Road Agents perform a periodic inspection of their own, but not on a regular basis. There is no repainting program in any of the communities surveyed, although Barrington reported having repainted one of their bridges in 1986. The only debris from the repainting operation was what was scraped off the bridge members using wire brushes and manual scrapers. The debris was not captured.

Sand and salt are spread on the bridges as the roads are sanded and salted. In the spring, the grit on the bridges is removed as part of the street sweeping in Dover and Barrington. Dover's street sweeping contains the grit, and stockpiles it behind the River Street facility. Barrington uses a side sweeper, which pushes the grit off the roadway, or in this case, off the bridges. In Rollinsford, the grit falls through the bridge deck, and into the water below. Farmington washes the bridge decks in the spring, using river water. The grit is transported off the bridge and is carried with the runoff.

Dover has the most catch basins, with 2050. Farmington has approximately 200, whereas Barrington and Rollinsford have only ditches. The curbs in Dover are 80% granite barrier or sloped type, and the rest are bituminous. In Rollinsford, the curbs are 50% granite, and 50% bituminous. Farmington has only 1.5-2 miles of granite curbing. In all three towns, there are only grate-type storm drain inlets. The drain inlets are inspected annually in Rollinsford and Farmington, and on an as-needed basis in Dover and Barrington. Dover has a program worked out where they clean about 500 inlets/yr. Rollinsford cleans about 10/yr. Farmington cleans those needing attention in September, whereas Barrington cleans inlets to culverts on an as-needed basis.

The material collected during cleaning in Dover is stockpiled behind the Public Works Garage on River Street and is mixed with

brush for fill. Rollinsford and Farmington both collect the material at the transfer station and landfill, respectively. The material collected from the culvert inlets and outlets in Barrington is left along the shoulder of the roads, or given to local residents in the area who have requested fill material. In each community, at least 90% of the storm drains discharge to surface water. Keeping inlets clean reduces the potential sediment load to the streams.

The number of sediment retention basins in Barrington is 5, and in Rollinsford is 35. Farmington has none. A list of 59 basins in Dover is provided in Appendix D. The basins are all inspected annually in the rural towns, and on an complaint basis in Dover. Rollinsford cleans approximately 10/yr, and Barrington cleans their basins on an as-needed basis. The basins in Dover are cleaned on approximately a five year cycle. Debris is taken behind the Public Works Garage in Dover and mixed with brush for fill. In Rollinsford debris is taken to the transfer station and stockpiled for future fill. In Barrington, it is deposited in the area of the basin, or given to area residents.

Culverts in the town of Farmington typically have a rock lined sediment trap at their outfalls, which is cleaned on a four-year cycle. Sediment is disposed of at the site of the outfalls. In Barrington there is no formal sediment trap structure at the culverts, but the outfalls are dug out as needed. Sediment is disposed of on site. In Dover, the only sediment traps are located on private property, typically at parking lots to trap oil and grease before the runoff is discharged into the storm drain system.

Vegetated waterways exist throughout the downtown area of Dover adjacent to the Cocheco River. In Rollinsford, there are vegetated waterways at Sligo gully, Old Mill Lane, the Transfer Station, and Woods Road. Farmington has four vegetated waterways. Each town inspects the waterways at least annually. Those in Rollinsford are also mowed once a year. Sediment accumulated in these waterways in Dover and Farmington are collected at the respective landfills.

Ditches are treated similarly. In each town ditches are kept open by excavation or regrading. In all but Farmington, this is done on an as-needed/complaint basis. In Farmington, it is done two to three times a year during the summer. In Barrington road grading on gravel roads is done annually, and backhoes work the ditches on a 5 year cycle. The debris is taken to the respective landfills, except in Barrington, where it is usually given to a list of people in the area

requesting fill. BMPs are not typically used during these operations. Dover and Barrington sometimes will reseed ditches if vegetation is removed. Rollinsford does not. Farmington does not typically remove vegetation when cleaning ditches.

Erosion from damaged vegetated areas adjacent to the roadways is kept in check through reseeding in three of the four surveyed towns, with Rollinsford as the exception. In Farmington, hydroseeding is used, which seeds and mulches in one operation. This is typically done by a contractor. No town applies fertilizer to roadside areas. In addition, Dover has instituted a program known as "Adopt a spot", where residents or local groups can assume the responsibility of maintaining an area of vegetated public land, such as parks, traffic squares, and medians. The residents receive recognition for their efforts through a posted sign at the location. In this way , the town is receiving active participation from its residents for approximately 12-14 areas, thereby relieving the town maintenance department is relieved of caring for

In municipal construction areas, Dover, Barrington, and Farmington typically use some sort of best management practice to control erosion. In Rollinsford, most contractor construction projects use BMPs. In each case, the effectiveness of the BHPs is evaluated by the road agent or the City Engineer (Dover) after major rainfall events. Typically the inspections showed the measures were working.

None of the towns surveyed used pesticides, herbicides, or fertilizers to any extent. In Dover, herbicides are used typically for control of poison ivy on strictly a complaint basis. There is one staff person qualified by the State of New Hampshire to handle agri-chemicals. Fertilizer is only used infrequently by Dover in the cemetery.

B. Snow Plowing and Sanding: In the 1995-1996 season the survey area had a near record snowfall of 112.5 in. In the previous season, there was only 60 in. For this past year, Dover listed 18 snow-plowing operations and 18 sanding operations, Rollinsford had 14 plowing operations and 21 sanding operations. Barrington had a combination of 26 snow operations. Farmington had 26 plowing operations, and 12 sanding operations. In Dover, Barrington, and Rollinsford, 100% of the plowing operations included sanding. In Farmington, only about 12% of the plowing operations included the spreading of sand and/or salt.

In each of the towns surveyed, the operators of the plow trucks are trained on the job, by riding with experienced operators, and at some point switching with the experienced driver. Operators from Dover and Barrington attend the annual snow plow rally. None of the towns have a formal training program.

In Barrington, three town-owned, and 2 contractor-owned trucks with V-box, slip-in spreaders plus one contractor-owned V-box permanent mount spreader truck are used to plow and sand the roads. The six plow routes for these trucks are indicated on Figure 6. The sand and salt spreaders were not calibrated. Application rates may be varied with controls in the truck cab. Barrington also uses pretreatment just as the snow flakes begin to fall. Their pretreatment mix is the same mix of salt and sand that is used at other times. The mix ratio is 5:1, sand:salt. Barrington does not spread sand with every pass of the plow, but will pretreat, and then plow off the snow and return to sand the bad spots afterward. The hills (Mt. Misery, Beauty Hill, Chesley Drive, Deer Ridge and Lee Oak Road) are sanded after every pass of the plow, as are the major intersections. The snow plowing begins after approximately 2-3 in. Of snow has fallen. Priority is given to bus routes, and those roads through hilly terrain. Gravel roads are done last, usually after 4-5 in. of snow has fallen. Priority routes are typically plowed twice for every plowing of the lower priority routes. Priority routes and problem areas are indicated on Figure 7. Barrington does not haul snow, but rather stockpiles it at each site.

Barrington uses approximately 4000 yd^3 per year of a sand/salt mixture. They apply approximately 200 yd^3 per year of straight sand to gravel roads in the winter. These roads are shown as dashed lines in Figure 6. Their material is stored at the town dump in a storage shed which has the capacity to hold 400 yd^3 of mixed sand and salt. It can hold up to 60 yd^3 of salt. Mixing is done on an asphalt pad in a ratio of 5:1. They will be constructing a new storage facility in the near future, approximately 300 ft from the current facility. The shed is three-sided, with the front covered by 6 mil plastic. There is no surface water control structures at the storage shed, but groundwater is monitored at the dump where the shed is located. No elevated levels of salt have been reported. A second stockpile of sand is at Second Crown Point Road, on bare ground with a tarp cover.

Rollinsford has only two plow routes, and two trucks with V-box slip-in spreaders. None of the spreaders were calibrated. It does not have established priority plow routes, except that the

police and fire departments are plowed out first. The two plow routes are shown in Figure 8. Plow crews begin their operations after 3-4 in. of snow has fallen. Roads are sanded with a sand/salt mix of 8:1 after the roads have been plowed. Exceptions are on hills, where the roads are sanded with each pass of the plow. No pretreatment is done, nor are prewetting agents used. Rollinsford does not haul snow, and only cleans snow from the intersection areas when visibility becomes a problem.

The Rollinsford storage facilities consist of a salt shed on an impermeable concrete slab,. Which holds only the salt. The shed is enclosed on three sides, with no door. Mixing is done outside on the bare ground. The mixture is stored outside and covered with a tarp. There is a perforated pipe installed in front of the shed door, and a gully behind the shed. Otherwise, no surface water control measures have been used. Rollinsford uses approximately 800 tons per year of sand and 100 tons per year of salt.

Farmington operates on a bare pavement 48 hours after the storm policy. They have 5 trucks with uncalibrated V-box slip-in spreaders, and a one-ton pick-up to do the cul-de-sacs. Farmington is split into 6 plow routes plus a sidewalk tractor route. The routes are described as 1.) Main arteries in and out of the downtown area, shown in Figure 9, 2.) East side of town, 3.) West side of town, 4.) East side of the outlying area, 5.) West side of the outlying area, and 6.) Dead end roads, fire station, school yard, and town hall. There are no established priority routes. The same operators and equipment are assigned to each route for every storm, except for sickness or breakdowns, respectively. The plow crews begin to spread sand almost immediately, with a 3:1 mix of sand:salt. If the snow is wet and "greasy" the plows begin to work right away. If it is a fluffy snow, they wait until at least one inch has fallen to start plowing. No pretreatment is used, nor are any prewetting agents added to the salt mix. On gravel roads, only straight gravel is spread, no salt.

Snow is occasionally hauled from the town square, and from Main Hill, Central Hill, and Tappan Street. In addition, intersections are cleaned as needed and the snow hauled away. The snow is deposited at the landfill.

In Farmington, the salt shed is located at the landfill. It consists of a 100 by 30 ft building with concrete walls and a wood frame structure with an asphalt-shingle roof. There are three bays, one with capacity for 300 tons of salt, and two for the sand/salt

mixture. An asphalt pad extends 40 ft beyond the shed on which the mixing is done. There is no surface water control structures, but groundwater is routinely monitored at the landfill, and there has been no evidence of elevated levels of salt. Farmington used approximately 8000 yd^3 of sand this year, which they sift themselves.

The rural towns maintained the same mix of sand and salt for both snow storms or ice storms. In Dover, they pretreat major arteries and collector streets using salt prewetted with liquid calcium chloride just before a snow or ice storm hits. After one inch of snow is on the streets, the trucks begin to plow. After 2-4 in. of snow has fallen, the trucks begin to sand. The trucks do not sand with every pass of the plow, but when the temperature is below 30° F, the plow trucks usually spread a layer of sand as they plow. When the temperature drops below 10° F, liquid calcium was substituted for salt. After the plowing, Dover usually sands the roads if they hadn't before. If conditions warrant, a sand/salt mix is used. Dover's policy is to reach bare pavement conditions for storms over 2 in. within 24 hours after the initial 2 or more inches of snow on all priority 1 and 2 streets.

Typically the Dover priority 1 and 2 streets are plowed twice for every one time plowing the lower priority streets. The priority intersections may be sanded up to 20 times more than the roads in a snow storm. In a typical ice storm, the priority intersections may be sanded 10 times in a 24 hour period. The priority routes are based on part on the traffic flow volumes, shown in Figure 10. The majority of the priority 1 and 2 routes and the priority intersections are shown in Figure 11. The priority one streets are indicated in orange, the priority 2 streets are shown in green.

Snow is removed and hauled away from the downtown Dover main street areas and downtown parking areas. The snow is deposited in a Dover area parking lot. This is a problem for Dover; there is very limited space in which to deposit snow.

Dover makes use of a fleet of 10 plow trucks with V-box slip-in spreaders, 4 trucks with tail-gate spreaders, 1 truck with a 40-yd^3 roll-off spreader, and two trucks with tow-behind spreaders commonly used for pretreatment. Each spreader was calibrated. Typically the same truck and operators are assigned to the same routes each time out, with the exception of breakdowns or sickness, respectively.

In the past year Dover used approximately 2000 tons of salt and 2500 tons of sand on the roads. Salt is stored in a three-sided, roofed storage bay at the Public Works facility on River Street, which has a 200 ton capacity. Sand is stored behind the garage. Mixing of sand and salt is presently done on a gravel surface. Typically only enough is mixed at a time for one storm, resulting in short term storage on a permeable surface. There are no surface water control measures at the storage or mixing sites.

C. Soil Stabilizers: Soil stabilizers, or dust palliatives are used in Barrington and in Farmington. In both towns, liquid calcium chloride is spread on a gravel road. This application tends to increase the binding of the soil particles to each other, and thus reduces air-borne dust. Barrington last year used two 20 gallon drums of liquid calcium chloride on Scruton Pond Road. They used to use waste oil in the distant past. Farmington applies approximately 0.3 gallons/yd^2 on the dirt roads in late April or early May. The dirt roads are each approximately 14 ft wide.

D. Street Sweeping and Debris Removal: All the towns surveyed do some sort of street sweeping to remove the grit and dirt from the road before it is washed into the drainage system. Dover sweeps all the city streets annually in the spring. In the summer months, the downtown areas are swept once a week from May to early September. The sweepings are taken to behind the Public Works Garage on River Street, and mixed with brush. Ultimately the material is used as fill. Dover does not track the amount of material recovered from the streets, but estimates the recovery at 50% of the material spread, or approximately 1200 tons.

Barrington collects only the sweepings from the intersections and cul-de-sacs. The Class V roads are side swept, removing the granular material from the paved road surface, and pushing it onto the shoulders. Typically, 8 yd^3 of material is recovered per year, and stockpiled behind the town garage for use as fill.

Rollinsford sweeps all of their streets once a year, in the spring. The volume of material recovered was reported as 40-50% of the volume spread. The material recovered is stockpiled at the transfer station, for future use as solid fill.

Farmington also sweeps its in-town streets, those shown in Figure 9, on an annual basis in the spring. They recover approximately 280 yd^3 of material, which is stockpiled at the landfill for use as backfill. Their streets are swept by a contractor.

V. Salt and Sand Loading

Preliminary calculations were made using the information obtained from the survey to estimate the non-point source distribution of sand and salt in each town. The results of this analysis are presented below for the surveyed towns.

Barrington used approximately 4000 yd^3 of sand and salt mixture this season on the paved Class V roads. This value included approximately 750 tons of salt, or approximately 500 yd^3. Assuming the priority routes are sanded twice for every sanding of the non-priority routes, and estimating the priority route mileage as 15 miles, the annual application rate for the non-priority routes are approximately 49.8 yd^3/mile. This annual application rate is roughly equivalent to a well rounded 5 gallon bucket of material spread over a 3 ft length of highway. The application rate for the priority routes is double this value, or 99.6 yd^3/mile. Considering just the salt, the total salt application rate for the entire year was 7.46 yd^3/mile. This is equivalent to approximately 7/8 of a gallon - milk jug of salt spread over one 3-ft long section of roadway. On unpaved roads, only sand was applied, at a rate of approximately 20 yd^3/mile, or roughly half of what was applied to the paved roads.

In Rollinsford, there were 15 miles of plowed roadways. Allowance was made for approximately 1 mile of problem areas (shown in Figure 8) which received twice as much material as the remaining roads. The annual usage for this season was 533 yd^3 of sand and 67 yd^3 of salt. The loading rate for sand was 33 yd^3/mile, and for salt it was 4.2 yd^3/mile.

Farmington did not have priority routes, or areas which received special attention, and consequently a disproportionate amount of sand and salt loading. Approximately 4000 yd^3 of sand were used this season on 66 miles of paved roads and 22 miles of unpaved roads. Straight sand was applied to the unpaved roads, representing 25% of the total mileage. Approximately 800 yd^3 of salt was applied to the paved roads, at a ratio of 3:1 sand to salt. The resulting application rate was 45.5 yd^3/mile for sand, and 12 yd^3/mile of salt.

In Dover, the usage of sand was 2500 tons per year, or approximately 1667 yd^3 per year. Dover also used approximately 2000 yd^3 of salt per year. The salt usage has been increasing in the past few years, and it is expected to continue to increase. Dover has 125 miles of paved surface, and 20 mile of unpaved roads. The priority 1 and 2 routes shown in Figure 10 represent approximately

50 miles, which typically receives double the amount of sand and salt as the rest of the paved surfaces. In addition, 15 priority intersections are sanded on the average of about 20 times for each storm. It is estimated that the material spread on these intersections is roughly equivalent to an additional 28 miles worth of road surface. The net result is that the annual loading rate of sand in Dover is 7.5 yd^3/mi of sand for the non-priority routes. The priority routes receive approximately 15 yd^3/mi of sand per year. The rate of salt application is not directly proportional to the sand usage, since Dover pretreats with salt. Thus, the volume of salt used is actually greater than the volume of sand. The application rates for the non-priority roads was estimated at 9 yd^3/mi for salt. The priority routes received double that, or 18 yd^3/mi.

A comparison of the rural loading rates and the urban loading rates is presented in Table 1. The table shows that of the rural communities, Barrington and Farmington, operating under bare pavement policies, have a slightly higher application than that of Rollinsford, which does not have a strict bare pavement policy. Farmington has the highest salt content in its sand/salt mix, and consequently has the highest application rate of salt of any of the towns. Application rates are similar between Barrington and Farmington, especially with respect to sand. The rural communities have a significantly higher sand application than that reported by Dover. Dover does have a higher salt application rate than all but Farmington.

Table 1. Comparison of Sand and Salt Loading of the Selected Towns

Town	Sand Loading Rate*	Salt Loading Rate
Barrington	49.8 yd^3/mi / 20 yd^3/mi	7.5 yd^3/mi.
Rollinsford	33.0 yd^3/mi	4.2 yd^3/mi
Farmington	45.5 yd^3/mi	12.0 yd^3/mi
Dover	7.5 yd^3/mi	9 yd^3/mi

*: Priority route rates are doubled.

The figures presented in Table 1 represent only the application loading rates. If the volume of material recovered from the street sweeping is taken into consideration, the net loading to the environment is, in some cases significantly less than that indicated

in Table 1. Two communities reported significant recovery of material from the roadway surfaces. Dover reported that as much as 50% of the material spread was recovered by the street sweeping program. In this case, the net sand loading rate would be 3.25 yd^3/mi for the non-priority routes, and double that for the priority routes. Rollinsford also reported recovering approximately 40-50% of the volume of sand spread in their street sweeping program. The net loading rate to the environment would be 16.5 yd^3/mi of sand. Farmington reported recovering 280 yd^3 of material from the town streets this past year. The town streets constitute approximately eight miles of roadway. This represents approximately a 75% recovery rate for in-town. This would reduce the environmental loading of sand in Farmington to 11.4 yd^3/mi. The rural areas of the Town of Farmington still maintained the 45.5 yd^3/mi loading rate. Barrington reported recovering only 8 yd^3 of material this past year from the major intersections. This is represents only 0.2% of the total loading, therefore there is no significant reduction in loading. The net environmental loading rates for the towns surveyed are summarized in Table 2. Dover has by far the lowest sand loading rate of any of the towns surveyed.

Table 2. Net Environmental Sand Loading Rate

Town	Net Sand Loading to Environment*
Barrington	49.8 yd^3/mi
Rollinsford	16.5 yd^3/mi
Farmington	11.4 (in town)/ 45.5 yd^3/mi (rural)
Dover	3.25 yd^3/mi

*: Priority Routes are Doubled.

VI. Conclusions and Recommendations

The objectives of this study were to identify the types of potential non-point source pollutants that are associated with standard highway maintenance practices in both an urban and rural setting in the coastal region of New Hampshire. A second objective was to try to quantify the loading of these pollutants, and map the distribution of the pollutants. Finally, the third objective was to evaluate the procedures used to gather the information presented in this report with respect to future efforts.

The study has identified the most prevalent substances being introduced into the environment is sand and salt. Sand and associated fines can contribute to the sediment loading of surface waters, increasing turbidity. Salt can affect both surface waters and groundwaters beneath the roadways. Liquid calcium chloride is applied to gravel roads in two towns. In Barrington, dirt and sediment from ditches and drainage structures is spread on site, leaving the potential for the material to be washed into the drainage waters again. A significant reduction in the environmental loading of sand and potential sediment is realized by sweeping the roadways and collecting the sweepings. Both Dover and Rollinsford reported up to 50% recovery rates.

Loading rates were estimated based on the information provided in the surveys. These rates ranged from 33 -50 yd^3/mile of sand on rural roadways and from 4.2 to 12 yd^3/mile of salt. The urban loading rates were much lower for sand, 7.5 yd^3/mi. The salt usage was comparable to the surrounding communities.

As to general maintenance practices, all the communities surveyed had similar practices. The winter roadway maintenance program of the urban community was more sophisticated, but the rural communities compared favorably with what was being done in the urban areas, especially given the more limited financial resources and similar land areas as the urban area. The urban area had significantly more roadway mileage, requiring a more intensive maintenance program.

The survey and interview procedure was successful in obtaining useful information which has lead to the evaluation of non-point source loading rates for sand and salt. At this point a follow-up interview would be recommended to verify the information interpretations used in this report, and to obtain more details to aid in the distribution mapping of the material. In some cases, clarification would as to the extent of the priority routes which typically receive more loading for a given storm event than non-priority routes would have enhanced the analyses. In most cases, the required information was obtained by interviewing only the Road Agent or Public Works Director of the municipality. Future surveys in urban communities may be enhanced by interviewing not only the public works director, but also the supervisors which report to the director, to obtain specific details of the maintenance practices.

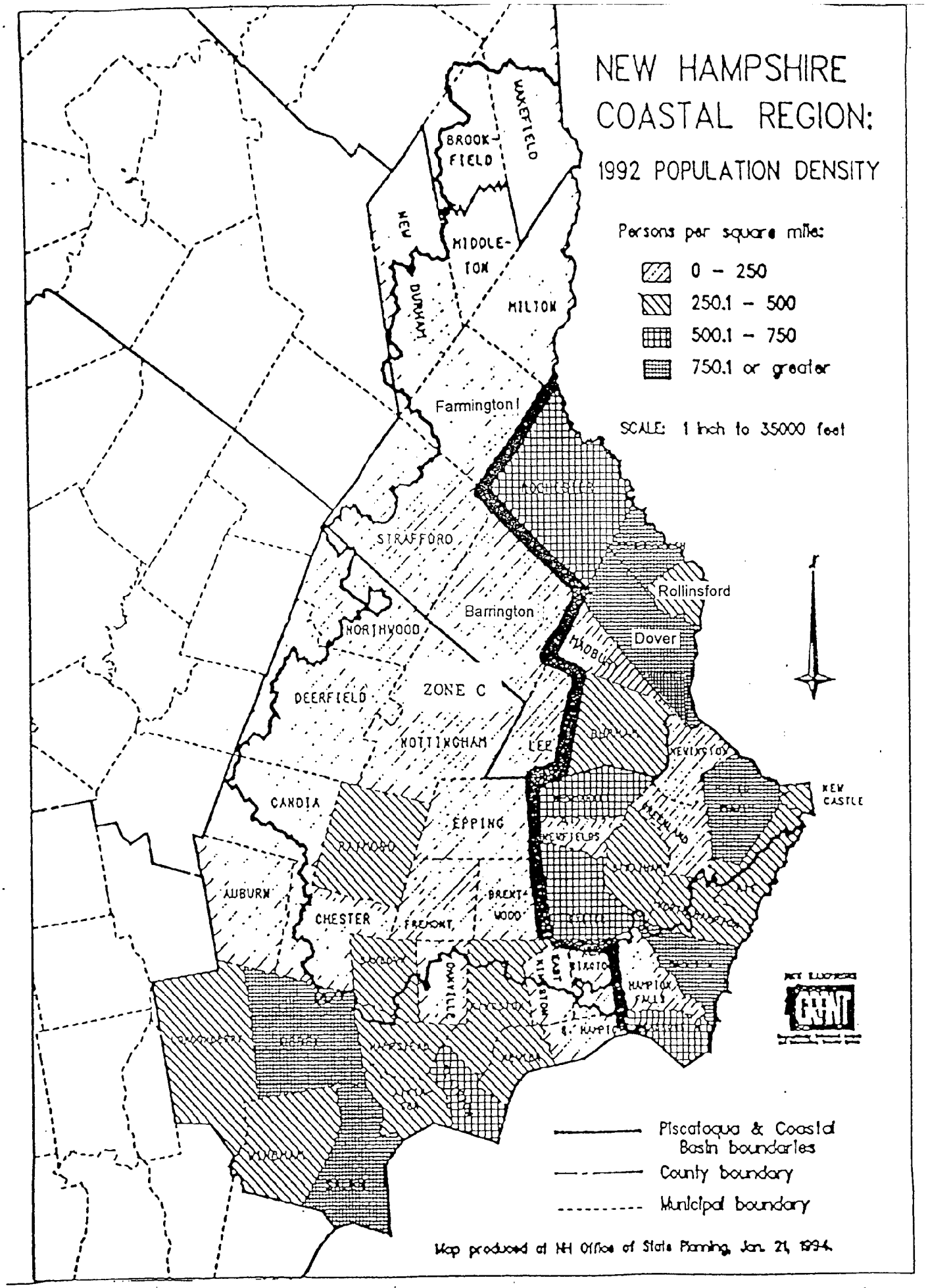

Figure 1. Pilot Study Town Locations

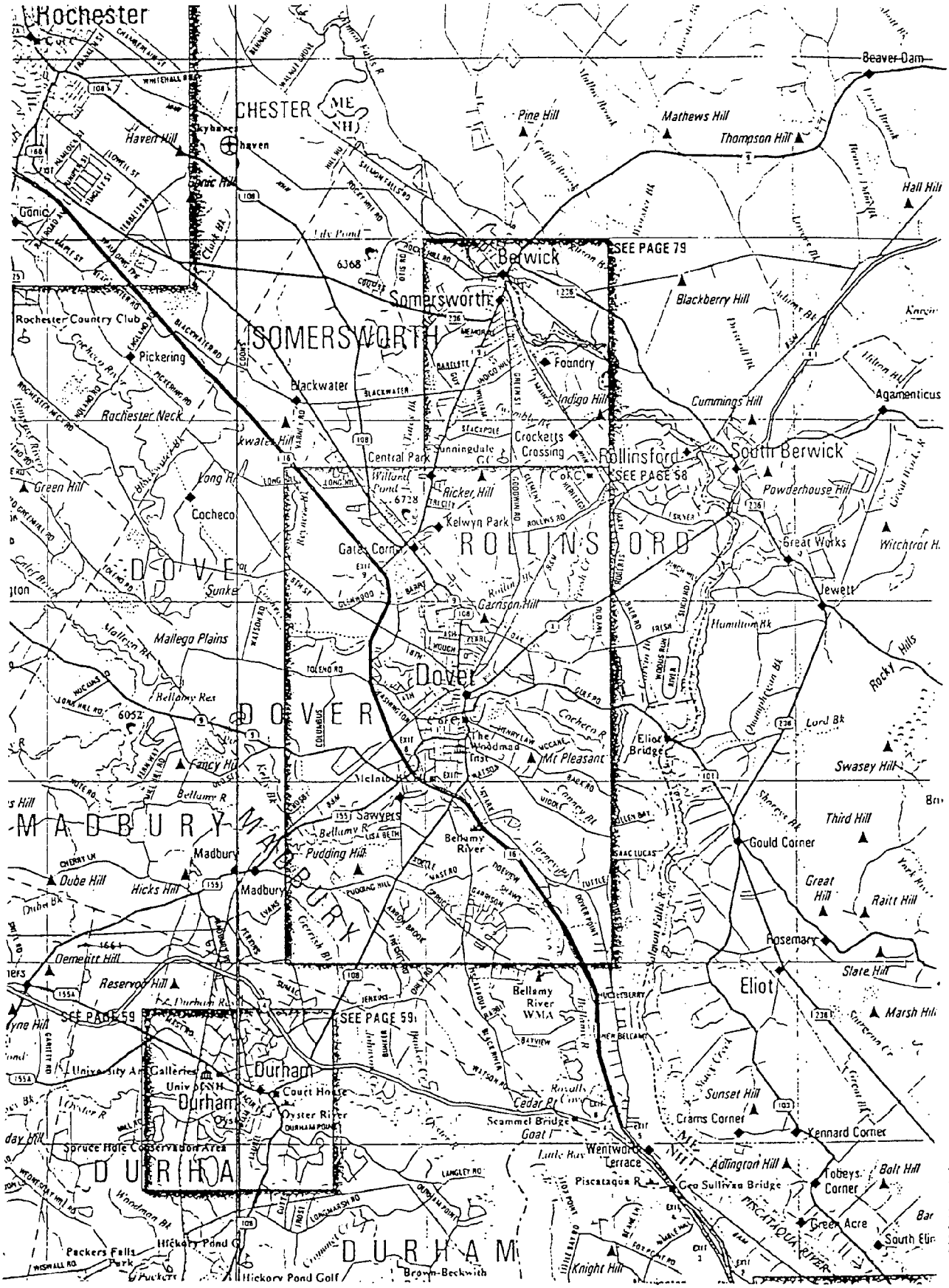

Figure 2. Town of Dover Road Map.

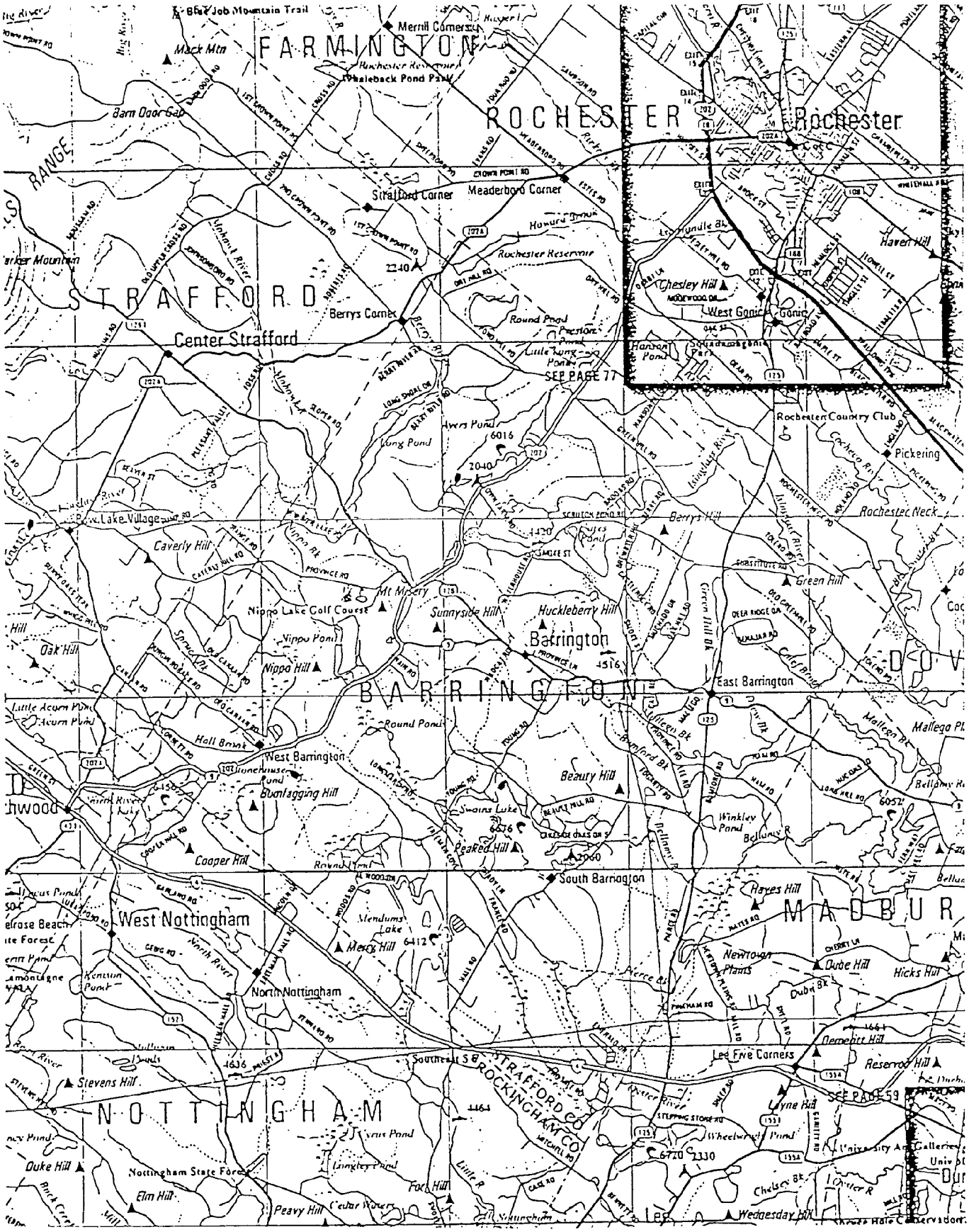

Figure 3. Town of Barrington Road Map.

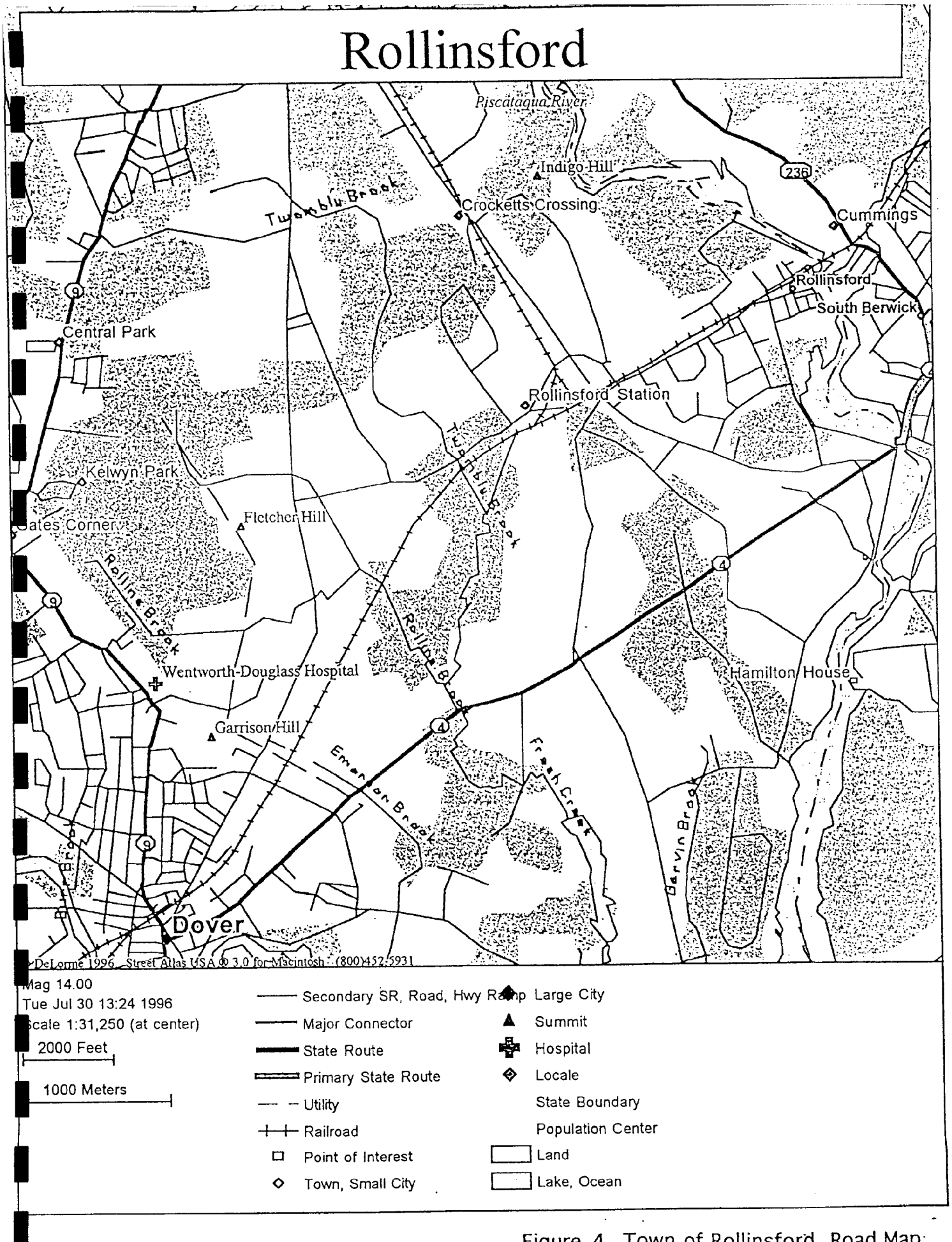

Figure 4. Town of Rollinsford Road Map.

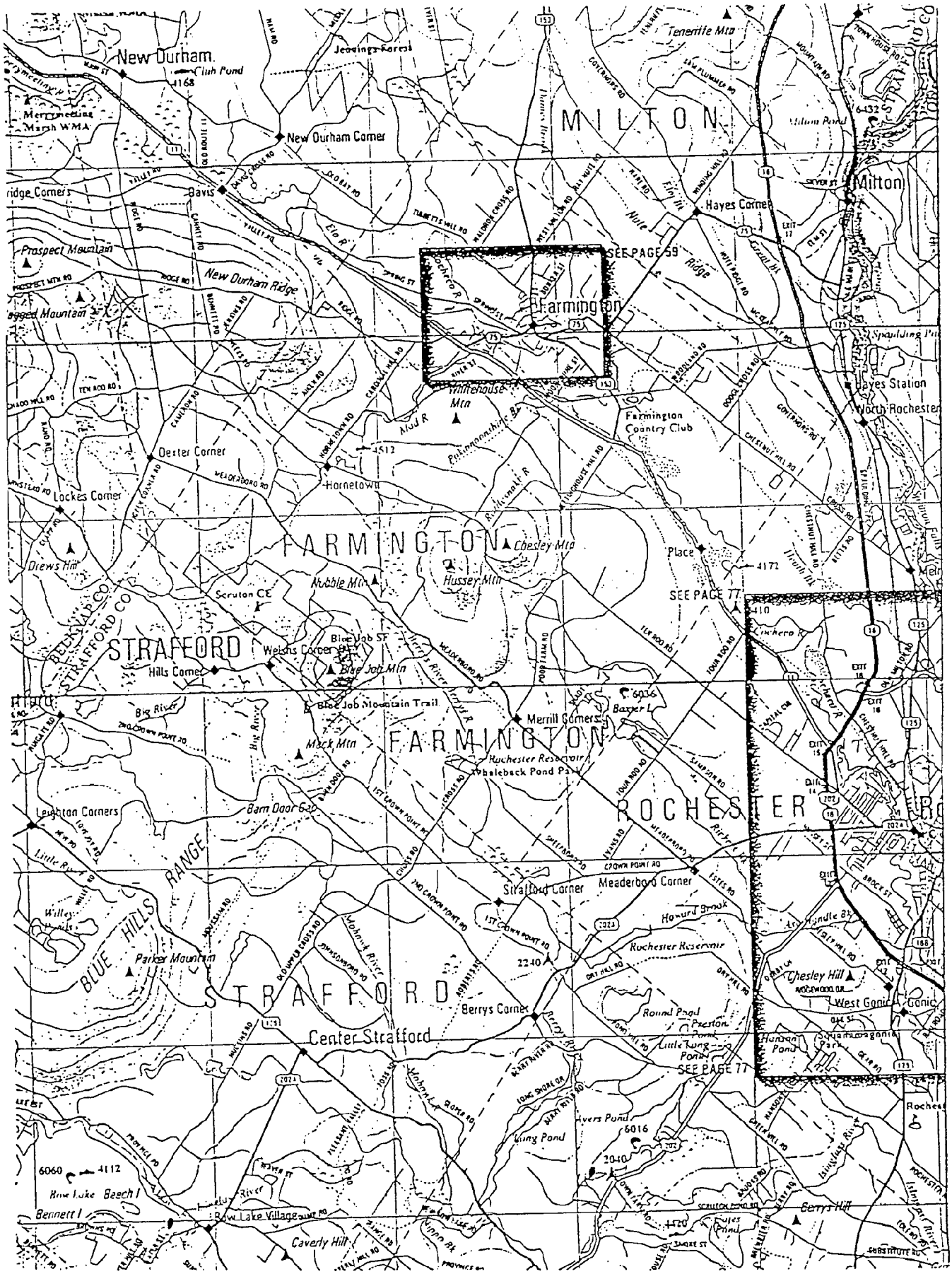

Figure 5. Town of Farmington Road Map.

Figure 8. Rollinsford Plow Routes

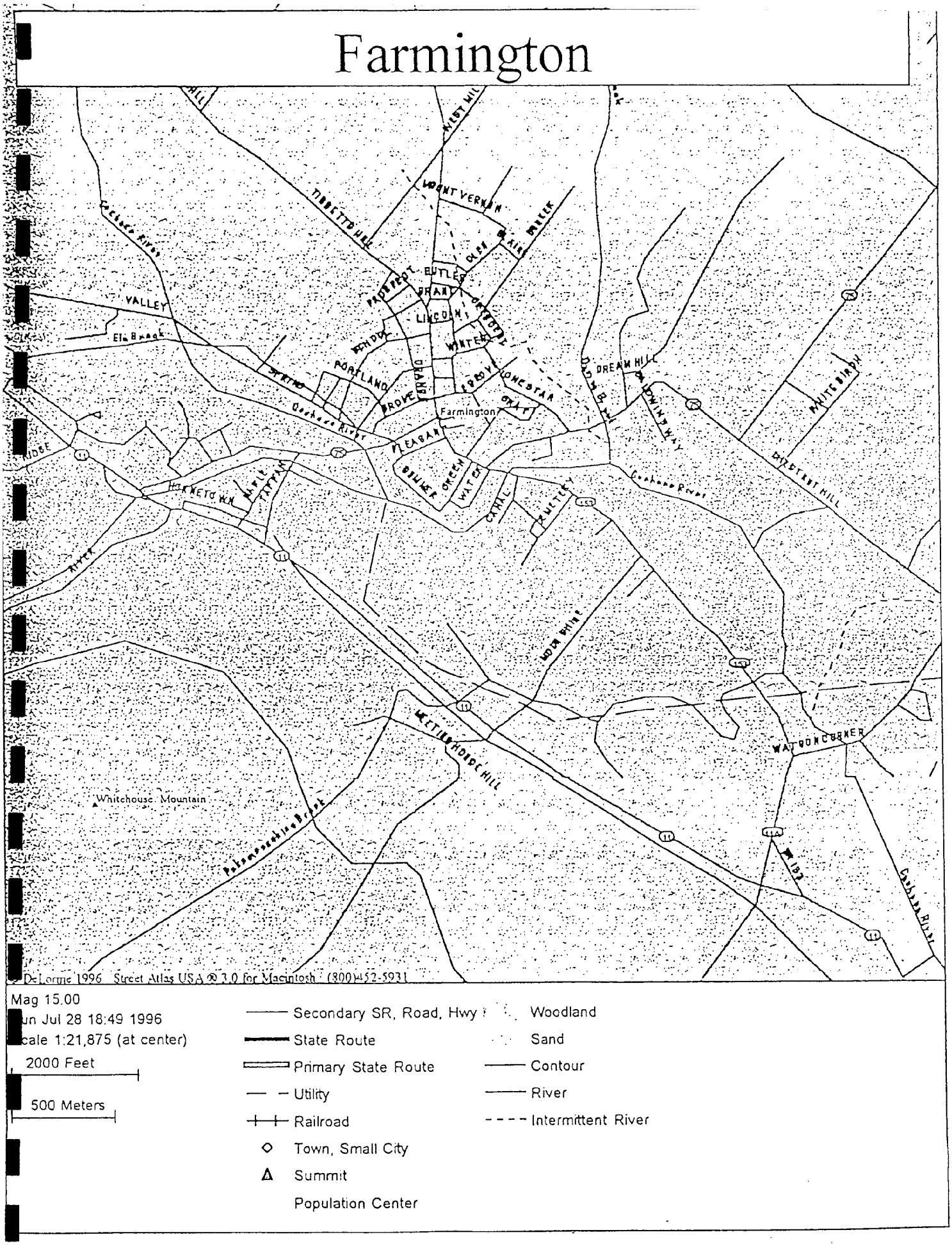

Figure 9. Farmington Downtown Area

DOVER TRAFFIC VOLUMES

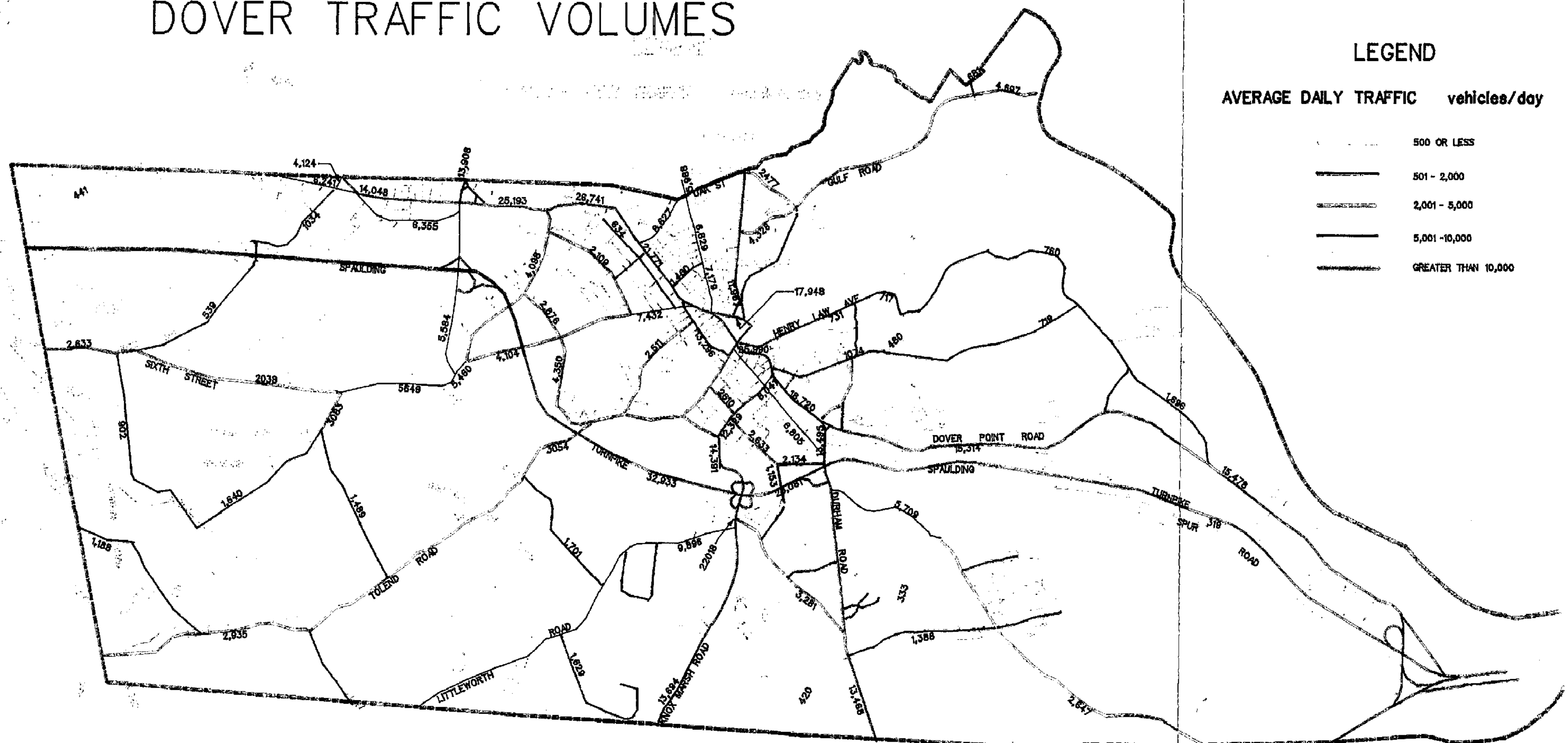

FIGURE 2

Taken from Roadway Management Report, City of Dover Engineering Department, 1994.

Figure 10. Dover Traffic Volumes

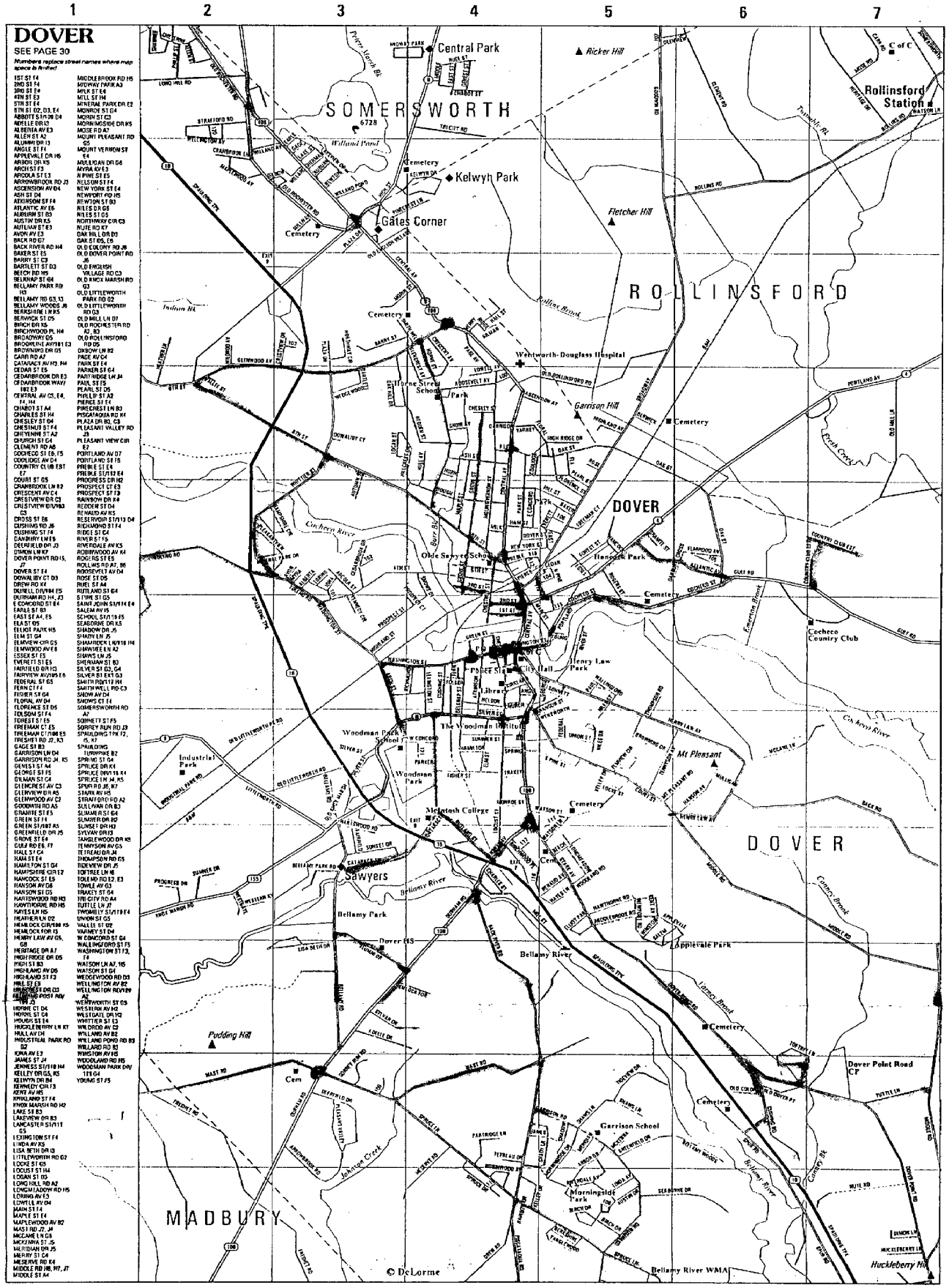

Figure 11. Dover Priority 1 and 2 Salt Routes

APPENDIX A. Survey of Road Maintenance Practices

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Research Assistant Professor
Civil Engineering Office, UNH
(603) 862-1545
form RS1.0-1996

University of New Hampshire
Department of Civil Engineering/
Technology Transfer (T^2)

Survey of Road Maintenance Practices

This survey was adapted from a survey conducted in Minnesota to reflect the information we are seeking. We realize the information requested is quite detailed, and that not all of it may be available. Please gather as much of the information as you can. You may attach copies of lists, routes, schedules, etc., as applicable, to minimize the time involvement. Try to be as accurate as possible. Identify that information which is not recorded or otherwise not available. If you have any questions as to our intent, or meaning, pass over that particular question, and we will discuss it later. I will contact you to arrange a meeting where we can work on completing this survey together, or at least you can point me in the direction of the information you have available.

I. Snow Removal and Traction Management

General Information

1.) Name of Jurisdiction: _____

2.) Present Population in Jurisdiction: _____

3.) Centerline miles of roadway of:

Unpaved roads:	
Paved two-lane roads/ local streets:	
Multiple lane/major arterials:	
State or Federal highways:	

4.) Number of the following features:

Cul-de-sacs/dead ends:	
Bridges:	
Alleys:	
Other (specify):	

5.) Indicate approximate % of the type of curbs in your jurisdiction:

surmountable_____ bituminous_____ right angle_____

concrete_____ barrier _____

other: (type & percent of total)_____

6.) Types of drain inlets in jurisdiction: (approximate % of total)

curb openings: _____

grate inlet: _____

other (specify): _____

7.) How often are drain inlets inspected? _____

cleaned? _____

8.) Where is collected debris disposed of? _____

_____

_____

_____

9.) Percentage of storm drains connected to sewer lines? _____

10.) Percentage of storm drains discharging to surface water? _____

Snow plowing / sanding

11.) Recorded total winter snowfall in:

1993-94 :	
1994-95 :	
1995-96 :	

12.) Total number of snow-plowing operations in:

1993-94 :	
1994-95 :	
1995-96 :	

13.) What percentage of above snow plowing operations included sanding / salting in:

1993-94 :	%
1994-95 :	%
1995-96 :	%

14.) Total number of sanding / salting operations in:

1993-94 :	
1994-95 :	
1995-96 :	

15.) Was there any difference in the amount of sand and salt applied during a snowfall event compared to an ice storm, ☐ No ☐ Yes If Yes, please explain? _____

_____

_____

_____

16.) Please fill the table below for the personnel manpower evaluation for snow removal:

Snowplowing Employee Data	Snowplowing Personnel			
	Supervisors	Regular Staff	Back-up Staff	Contract Staff
Number of snowplowing employees				
Employee Man-hours 94-95				
Employee Man-hours 95-96				
List Plowing Contractors				

17.) Please indicate the type of equipment used in your jurisdiction for spreading sand and salt:

Sand/Salt Spreading Equipment	Number	Calibrated?		
		Yes	Frequency	No
Trucks equipped w/ Tail-gate Spreaders				
Trucks w/ V-box, Perm. Mount Spreaders				
Trucks w/ V-box, Slip-in Spreaders				
Trucks with Tow-Behind Spreaders				
Trucks equipped w/ Other Spreaders (list):				

18.) Please complete the following table with descriptions of the route locations and the operators and equipment assigned to each route if applicable, or attach route assignment sheets.

No.	Route Description	Operator(s)	Spreader(s)

19.) Are priority routes established for first snow plowing and road treatment?

❑ No ❑ Yes If Yes, complete following table with route number or descriptions of their locations (or attach priority list):

Priority 1 Location / Route Description	Priority 2 Location / Route Description	Priority 3 Location / Route Description

20.) Are priority intersections identified? ☐ No ☐ Yes If Yes, please indicate location in the following table, or attach a summary sheet.

Priority 1 Location / Route Description	Priority 2 Location / Route Description	Priority 3 Location / Route Description

21.) How many snow plowing routes in jurisdiction? _____

22.) Are the same operators assigned to the same routes for each snow/ice event?

❒ No ❒ Yes

23.) Are the same plows and spreaders used on the same routes for each snow/ice event?

❒ No ❒ Yes

24.) How often are priority routes plowed in relation to lower priority routes? _____

_____

_____

25.) Are the roads sanded with every pass of the plow? _____

_____

_____

26.) Is computerized routing software used in the jurisdiction? _____

27.) How often are the routes reevaluated? _____

28.) What kind of training do snowplow operators receive? _____

_____

_____

_____

29.) After what amount of snowfall do crews begin to plow? _____

_____

30.) After what amount of snowfall do crews begin to spread sand? _____

_____

31.) After what amount of snowfall do crews begin to spread salt? _____

_____

32.) Are anti-icing measures or pavement pre-treatment methods routinely used prior to snowfalls? ❒ No ❒ Yes If yes, describe methods: _____

_____

_____

33.) Is the salt or salt/sand mix routinely pre-wetted? ❑ No ❑ Yes

If yes, what procedure is used? _____

_____

_____

_____

And, what material is used to pre-wet? (i.e. salt brine, chemical, water..) _____

_____

34.) Please summarize the material use and the circumstances under which each is used.

Materials Used	Total Use	Unit Cost	Proportion and Conditions for Use (percent material used and weather conditions for use)
Sand only			
Salt only (no sand)			
Salt/Sand Mix			
Dry Calcium Chloride			
Liquid Calcium Chloride			
Alternative Deicers (specify)			
Other:			

Material Storage:

35.) Please fill out the table below with respect to the storage of sand and salt:

Facility	Number of Storage Facilities				
	Salt	Sand	Salt/Sand Mix	Location(s)	Drain Control
Outside covered pile on impermeable pad					Yes/No
Outside covered pile on ground surface					Yes/No
Outside uncovered pile on impermeable pad					Yes/No
Outside uncovered pile on ground surface					Yes/No

36.) What type of storage facilities are used for sand and salt? _____

_____

_____

_____

_____

37.) Are the storage facilities fully-, partially- or not- enclosed? ❑ No ❑ Yes If Yes, describe: _____

_____

_____

_____

38.) Is water runoff controlled around the storage facilities? ❑ No ❑ Yes If Yes, describe: _____

_____

_____

_____

39.) Is water runoff controlled around the mixing and loading areas? ☐ No ☐ Yes If Yes, describe: _____

_____

_____

40.) Is infiltration controlled at each storage site? ☐ No ☐ Yes If Yes, how? _____

_____

_____

_____

41.) Is infiltration controlled at each mixing / loading site? ☐ No ☐ Yes If Yes, how? _

_____

_____

_____

42.) Does part of clean-up operations include:

a. Removing snow windrows? ☐ No ☐ Yes If Yes, where? _____

_____

_____

_____

_____

_____

b. Hauling and disposing of snow? ☐ No ☐ Yes

c. Cleaning intersections? ☐ No ☐ Yes

d. Cleaning medians? ☐ No ☐ Yes

e. Other? (specify) _____

43.) Where is the removed snow deposited? _____

_____

_____

44.) How is the effectiveness of the snow plowing/removal program evaluated? _____

_____

_____

_____

II. Soil Stabilizers

1.) Are soil stabilizers or dust palliatives used? ☐ No ☐ Yes If Yes, indicate where:

_____

_____

_____

_____

_____

2.) How often are they applied? _____

_____

_____

3.) What is used? _____

_____

_____

III. Bridge Maintenance Practices

1.) Number of bridges in jurisdiction? _____

2.) How often are they inspected? _____

3.) How often are they repainted? _____

4.) What methods are used to collect and dispose of old paint debris? _____

_____

_____

_____

5.) Where is debris disposed of? _____

_____

_____

6.) How often is grit (sand) removed from the bridge surfaces? _____

_____

_____

_____

IV. Street Sweeping and Debris Removal

1.) What streets or route areas have debris swept? _____

_____

_____

_____

_____

_____

2.) How often are streets swept? _____

_____

_____

3.) Where is the swept material disposed of? _____

_____

_____

_____

4.) Is the volume or weight of the collected material recorded? _____

_____

5.) Is the percentage of grit recovered calculated? _____

_____

If so, how? _____

_____

_____

And, typically, what is the recovered percentage? _____

_____

6.) Is the collected material stockpiled? ☐ No ☐ Yes If Yes, Where? _____

_____

_____

If Yes, what is the ultimate use of the material? _____

_____

_____

V. Catch / Sediment Basin and Culvert Maintenance

1.) Number of catch/sediment basins in jurisdiction : _____

2.) Where are the major sediment/catch basins located? (attach list if available) _____

3.) Inspection frequency of the basins: _____

4.) Cleaning frequency of the basins: _____

Where is the removed sediment disposed of? _____

5.) Are outfalls and outlet structures inspected? ☐ No ☐ Yes If Yes, how often? _____

6.) Where are the major culverts located? (attach list if available) _____

7.) Do culvert outfalls have sediment traps? ☐ No ☐ Yes

If Yes, what is their cleaning frequency? _____

_____

And where is the sediment disposed of? _____

_____

_____

_____

8.) Are there vegetated waterways in the jurisdiction? ☐ No ☐ Yes If Yes, Where? ___

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

9.) Are vegetated waterways inspected, cleaned and repaired? ☐ No ☐ Yes

If Yes, what is the inspection frequency? _____

If cleaned, where is the sediment disposed of? _____

_____

_____

V. Pesticide, Herbicide and Fertilizer Application

1.) If pesticides, herbicides or fertilizers are used in annual maintenance procedures, please complete the following tables: (If more space is needed, use the back of the form)

Pesticide (type)	Application Frequency	Application Method	Locations of Application

Herbicide (type)	Application Frequency	Application Method	Locations of Application

Fertilizer (type)	Application Frequency	Application Method	Locations of Application

2.)Do you have a pesticide-herbicide management program? ❑ No ❑ Yes

If Yes, please describe: _____

_____

_____

_____

_____

_____

VI. Construction Practices

1.) Are Best Management Practices (BMPs) used at municipal construction sites?

☐ No ☐ Yes

2.) Are the effectiveness of these practices evaluated after rainfall events? ☐ No ☐ Yes

If yes, what were the results?_____

_____

_____

_____

If Yes, how are they evaluated? _____

_____

_____

_____

3.) Are ditches kept open by regrading or excavating? ☐ No ☐ Yes

If Yes, how often? _____

And where? (Attach list if available)_____

_____

_____

_____

_____

_____

_____

4.) Where is removed debris disposed of? _____

_____

_____

5.) Are BMPs used in the ditches during this operation? ☐ No ☐ Yes If Yes, what type?

_____

_____

6.) Is vegetation typically removed in the ditches during this operation? ☐ No ☐ Yes

7.) Are ditches reseeded after regrading? ☐ No ☐ Yes

8.) Are damaged roadside vegetated areas reseeded? ❑ No ❑ Yes

9.) Are damaged roadside vegetated areas mulched? ❑ No ❑ Yes

10.) Are damaged roadside vegetated areas fertilized? ❑ No ❑ Yes

---

Form Completed By: _____(signature)

Title: _____

Date: _____ Phone #: _____

APPENDIX B. Interview Questionnaire for Survey of Road Maintenance Practices

Larry Brannaka Ph.D. P.E
Water Resources Research Professor
Civil Engineering Office, UNH
(603) 862-1428
form RS1.1-1996

Interview Questionnaire for:
Survey of Road Maintenance Practices
University of New Hampshire
Department of Civil Engineering / T^2

(Complete these questions during interview with jurisdiction representative and with completed Survey of Road Maintenance Practices form RS1.0-1996.)

Jurisdiction: _____

Person(s) interviewed: _____

Date of interview: _____

I. Snow Plowing / Sanding

1) Does jurisdiction have a written snow plan or policy? _____

   If so, who has it been approved by? _____

2) Are policies different for different snow storms and conditions? _____

   If so, how? _____

3) How many times have policies been used in 1995-96? _____ 1994-95? _____

4) Specify snowplowing policy procedures, if set according to:

   a) Class of street. _____

   b) Level of service desired. _____

   c) Time of day. _____

   d) Amount of traffic. _____

   e) Weather conditions. _____

   f) Other (specify). _____

1) Are these policies communicated to the employees? _____ If so, how? _____

   _____

6) Are these policies communicated to the public? _____ If so, how? _____

_____

7) Does jurisdiction have a bare pavement policy? _____

If so, specify. (i.e., type of roads, specific roads, particular intersections)

_____

_____

8) Does jurisdiction have a policy for snowplowing and sanding / salting sidewalks?

9) Which sidewalks are: plowed? _____

sanded? _____

salted? _____

10) Where is Salt and Sand stored? _____

j) How is runoff controlled around the storage facility? _____

k) How is runoff controlled around mixing and loading areas? _____

_____

c) When is the salt delivered? _____

d) How is it handled? _____

e) What happens to carry-over volumes?

_____

11) How many miles of State and Federal highways in jurisdiction?

_____

Are there cooperative agreements? _____

12) Does jurisdiction share or cooperate in the use of equipment, personnel, or duties? _____

If so, please list:

a) Materials: _____

b) Equipment: _____

c) Operators: _____

d) Plowing service: _____

e) Other: _____

Please specify with whom:

f) Other governmental jurisdictions: _____

g) Other departments:

_____

h) Other groups/interests:

_____

II. Pesticide, Herbicide and Fertilizer Application

2) Is there a staging area for mixing and tank loading of:

a) Pesticides? _____ Where? _____

b) Herbicides? _____ Where? _____

c) Fertilizers? _____ Where? _____

2) Does staging area(s) have runoff control features? _____

If so, what are they? _____

Do they require maintenance? _____

3) Where are chemicals stored? _____

4) How is the application equipment cleaned?

_____

_____

5) Where are they cleaned? _____

6) Are there controlled drains at the cleaning / staging areas? _____

7) Where is drainage routed / disposed? _____

8) What is done with excess chemicals in the application tanks?

_____

III. Other Aspects of Road Maintenance Practices

Interviewed By: _____ Date: _____

APPENDIX C. Survey of Road Maintenance Practices Summary of Responses

Larry Brannaka Ph.D. P.E.
Research Assistant Professor
Civil Engineering Office, UNH
(603) 862-1545
form RS1.0-1996

University of New Hampshire
Department of Civil Engineering/
Technology Transfer (T^2)

Survey of Road Maintenance Practices
Summary of Responses

This survey was adapted from a survey conducted in Minnesota to reflect the information we were seeking. It was sent out to the Road Agents or Public Works Director of each municipality for them to review and gather together information. An interview was scheduled within two weeks of sending out the surveys. At the interview, we went ouver the survey in detail, and gathered additional information through the conversations that ensued. Of the four municipalities surveyed, only one had filled out the survey forms in advance. The responses to each of the survey questions are concisely summarized below.

I. Snow Removal and Traction Management

General Information

1.) & 2.) Name of Jurisdiction; Present Population in Jurisdiction:

Dover: pop. 26,800 Barrington: pop. 6,700

Rollinsford: pop. 2,600 Farmington: pop. 5,800

3.) Centerline miles of roadway of:

Centerline Roadway Miles	Dover	Barrington	Rollinsford	Farmington
Unpaved roads	20	10		22
Paved two-lane roads/local streets	125	52	15	66
Multiple lane/major arterials	0			
State or Federal highways	26.5	23.2	17	15

4.) Number of the following features:

Roadway Features	Dover	Barrington	Rollinsford	Farmington
Cul-de-sacs/dead ends:	27	27	16	3/13
Bridges:	1	1	1+1 RR owned	11
Alleys:	0	0	0	5
Other (specify):				

5.) Indicate approximate % of the type of curbs in your jurisdiction:

Curb Types	Dover	Barrington	Rollinsford	Farmington
Granite Barrier	80%		50%	≈ 1.5-2 mi.
Bituminous Barrier	15%	100%	50%	0
Concrete	5%	0	0	0

6.) Types of drain inlets in jurisdiction: (approximate % of total)

Drain Inlets	Dover	Barrington	Rollinsford	Farmington
Grates	100%		100%	100%
Curb openings				
Catch Basins	2050	Ditches only		≈ 200

7.) & 8.):

Drain Inlets:	Dover	Barrington	Rollinsford	Farmington
Drain inlets inspected	As needed	As Needed	Annually	Annually
Drain inlets cleaned	500/yr	As Needed	10/yr	September
Debri Disposal	Turnkey	Shoulder/Dump	Transfer Station	Landfill

Notes:

1. Dover stockpiles some debri, and mixes it with brush behind their highway barn. Petroleum contaminated soils/sediments disposed as a hazardous waste.
2. Barrington cleans the ditches and leaves the material along the shoulder, or if there is too much, it is collected and transported to the dump.

9.) & 10.):

Storm Drains	Dover	Barrington	Rollinsford	Farmington
Percentage of storm drains connected to sewer lines	≤ 10%	None	Basement drains only	None
Percentage of storm drains discharging to surface water	≥ 90%	100%	Foundary Street Area	20%

Snow plowing / sanding

11.) Recorded total winter snowfall in:

1993-94 :	≈ 48 in.
1994-95 :	60 in,
1995-96 :	112.5 in.

12.) Total number of snow-plowing operations in:

Number of Snow Plowing Operations	Dover	Barrington	Rollinsford	Farmington
1993-94 :	Rec. Not Avail.	No Record	No Record	No Record
1994-95 :	9	No Record	2	1
1995-96 :	18	26	14	26
Percent operations includ.sand/salt	100%	100%	100%	12%

14.) Total number of sanding / salting only operations in:

Number of Sanding/Salting Only Oper.s	Dover	Barrington	Rollinsford	Farmington
1993-94 :	Rec. Not Avail.	No Record	No Record	No Record
1994-95 :	9	No Record	7	No Record
1995-96 :	18	Includ. above	21	12

15.) Was there any difference in the amount of sand and salt applied during a snowfall event compared to an ice storm?

Dover: ☐ No ✔ Yes In icey conditions: pretreat. Below 10° F no salt, used liquid calcium chloride.

Barrington: ✔ No ☐ Yes

Rollinsford: ✔ No ☐ Yes

Farmington: ✔ No ☐ Yes

16.) Please fill the table below for the personnel manpower evaluation for snow removal:

Snowplowing Employee Data	Snowplowing Personnel			
	Supervisors	Regular Staff	Back-up Staff	Contract Staff
Number of snowplowing employees				
Dover				
Barrington	1	4	0	4
Rollinsford	1	3	2	0
Farmington	1	7	9	0

17.) Please indicate the type of equipment used in your jurisdiction for spreading sand and salt:

Salt and Sanding Equipment	Dover	Barrington	Rollinsford	Farmington
Trucks equipped w/ Tail-gate Spreaders	4			
Trucks w/ V-box, Perm. Mount Spreaders	1: 40 yd. Roll Off	1 (Contractor owned)		
Trucks w/ V-box, Slip-in Spreaders	10	3: Town owned 2: Contract. owned	2	5
Trucks with Tow-Behind Spreaders	2			
Trucks equipped w/ Other Spreaders (list):				1 ton pick-up for cul-de-sacs
Equipment Calibrated? If so, Frequency?	Yes, 3-4 yrs.	No	No	No

18.) Route Locations. Route Sheets attached at the end of the summary.

19.) Are priority routes established for first snow plowing and road treatment?

Dover:	☐ No ✔ Yes	See attached list.
Barrington:	☐ No ✔ Yes	**See attached list**
Rollinsford:	☐ No ✔ Yes	Fire department and Police Department on Main st.
Farmington:	✔ No ☐ Yes	

20.) Are priority intersections identified?

Dover:	☐ No ✔ Yes	See attached sheet.
Barrington:	☐ No ✔ Yes	Mt. Misery, intersections along Rt.125, Beauty Hill, Province Hill, along State routes.
Rollinsford:	✔ No ☐ Yes	
Farmington:	✔ No ☐ Yes	

Questions:	Dover	Barrington	Rollinsford	Farmington
21.) How many snow plowing routes in jurisdiction?	22	3 Town 3 Contractors	2	6
22.) Are the same operators assigned to the same routes for each snow/ice event?	Yes	Yes	Yes	Yes
23.) Are the same plows and spreaders used on the same routes for each snow/ice event?	Yes	Yes	Yes	Yes
24.) How often are priority routes plowed in relation to lower priority routes?	2:1	2:1	NA	NA
25.) Are the roads sanded with every pass of the plow?	No	No	No	No
26.) Is computerized routing software used in the jurisdiction?	No	No	No	No
27.) How often are the routes reevaluated?	Annual Debrief	Annually (usually)	NA	Seldom

28.) What kind of training do snowplow operators receive?

Dover: Instituting cross training with supervisors, and experienced operators, once a year they attend snow plow rally. No formal training.

Barrington: Ride along with experienced operators, supervised before soloing; snow plow rally.

Rollinsford: Ride along with experienced operators, supervised before soloing

Farmington: New person operates wing plow with Road Agent, then they switch. After 2-3 storms, they go on their own.

Question:	Dover	Barrington	Rollinsford	Farmington
29.) After what amount of snowfall do crews begin to plow?	≈ 1 in.	2-3 in.	3-4 in.	Wet & heavy: right away. Fluffy: 1 in.
30.) After what amount of snowfall do crews begin to spread sand?	2-4 in.	Pretreat with sand/salt mix.	After plowing	Right Away
31.) After what amount of snowfall do crews begin to spread salt?	2-4 in. Also common to pretreat	Pretreat with sand/salt mix.	After plowing, direct salt on in emergencies.	Right Away
32.) Are anti-icing measures or pavement pre-treatment methods routinely used prior to snowfalls?	Yes. 3 or 4 trucks with liq. Calcium Chloride to spray on sand/salt, priority areas	Yes, with sand/salt mix	No	No

33.) Is the salt or salt/sand mix routinely pre-wetted?

Dover: ✔ No ❑ Yes

Barrington: ✔ No ❑ Yes

Rollinsford: ✔ No ❑ Yes

Farmington: ✔ No ❑ Yes

34.) Please summarize the material use and the circumstances under which each is used.

	Dover	Barrington	Rollinsford	Farmington
Sand only	?	200 yd^3/yr (Dirt Roads)	0	Gravel Roads
Salt only (no sand)	?	Emergency only	Emergency only	Extreme Cond.
Salt/Sand Mix	?	4000 yd^3/yr	≈ 800 ton/yr. 8:1	≈ 8000 yd^3 3:1 mix
Dry Calcium Chloride	?	3 bags/yr	0	Not in winter
Liquid Calcium Chloride	?	0	0	Not in winter
Alternative Deicers (specify)	?	3/8 in. Stone on dirt roads None.	None	None

Material Costs	Dover	Barrington	Rollinsford	Farmington
Sand		$7.50 /$yd^3$	$5.00 /$yd^3$	Sieve own.
Salt		$29.66 /ton	$30.00 /ton	

Material Storage:

35.) Please fill out the table below with respect to the storage of sand and salt:

Facility	Number of Storage Facilities				
	Salt	Sand	Salt/Sand Mix	Location(s)	Drain Control
Outside covered pile on impermeable pad					Yes/No
Outside covered pile on ground surface					Yes/No
Outside uncovered pile on impermeable pad					Yes/No
Outside uncovered pile on ground surface					Yes/No

36.) What type of storage facilities are used for sand and salt?

Dover: Salt storage bay at the public works building holds 200 tons of salt. Dover is planning to construct a new storage facility. Sand is stored uncovered behind the public works garage. The material is mixed on a gravel surface and stored there for a short duration.

Barrington: Storage shed at the town dump has 400 yd^3 capacity for sand/salt mixture, 60 ton capacity for salt only. Mixing is done on a bituminous pad; 8:1 mix. A new storage facility will be constructed in the near future, about 300 ft away.

Rollinsford: At the town maintenance building is a salt shed on a slab. Sand and salt mixture is stored outside, covered with a tarp.

Farmington: Salt shed at the landfill 100x30 ft. With 8 ft concrete walls and a wood frame structure and asphalt shingle roof. There are three bays, one for salt (300 ton), the remaining two hold sand/salt mix. (300 ton each).

37.) Are the storage facilities fully-, partially enclosed?

Dover:	☐ No ✔ Yes	3 sided enclosure for salt.
Barrington:	☐ No ✔ Yes	3 sided shed; front covered with 6 ml plastic, 1 pitch to the rear.
Rollinsford:	☐ No ✔ Yes	Salt shed is enclosed on three sides with no door.
Farmington:	✔ No ☐ Yes	Three sided enclosure.

38.) Is water runoff controlled around the storage facilities? ☐ No ☐ Yes

Dover:	☐ No ✔ Yes	Water is channeled away from the mixing area and is kept out of the storage bay.
Barrington:	✔ No ☐ Yes	Groundwater monitoring at the dump...site of salt storage.
Rollinsford:	✔ No ☐ Yes	Except for a perforated pipe outside the shed door, and a gulley behind the shed.
Farmington:	✔ No ☐ Yes	

39.) Is water runoff controlled around the mixing and loading areas?

Dover:	✔ No ☐ Yes
Barrington:	✔ No ☐ Yes
Rollinsford:	✔ No ☐ Yes
Farmington:	✔ No ☐ Yes

40.) Is infiltration controlled at each storage site?

Dover:	☐ No ✔ Yes	For salt only.
Barrington:	✔ No ☐ Yes	
Rollinsford:	✔ No ☐ Yes	None for mixing, just salt bay itself is on concrete pad.
Farmington:	☐ No ✔ Yes	Asphalt pad 40 ft beyond bays. Groundwater monitoring wells at the landfill.

41.) Is infiltration controlled at each mixing / loading site?

Dover:	✔ No ☐ Yes	
Barrington:	✔ No ☐ Yes	
Rollinsford:	✔ No ☐ Yes	
Farmington:	☐ No ✔ Yes	Asphalt pad 40 ft beyond bays. Groundwater monitoring wells at the landfill.

42.) Does part of clean-up operations include:

a. Removing snow windrows?

Dover:	☐ No ✔ Yes	Downtown main street areas; downtown parking areas.
Barrington:	✔ No ☐ Yes	
Rollinsford:	✔ No ☐ Yes	
Farmington:	☐ No ✔ Yes	Haul snow from the square, Main Hill, Central Hill, Tappan Street; also use a sidewalk tractor.

b. Hauling and disposing of snow?

Dover:	☐ No ✔ Yes	
Barrington:	✔ No ☐ Yes	
Rollinsford:	✔ No ☐ Yes	
Farmington:	☐ No ✔ Yes	

c. Cleaning intersections?

Dover:	☐ No ✔ Yes	
Barrington:	✔ No ☐ Yes	
Rollinsford:	✔ No ☐ Yes	Only if visibility problem, and then no hauling.
Farmington:	☐ No ✔ Yes	

d. Cleaning medians?

Dover:	☐ No ✔ Yes	
Barrington:	✔ No ☐ Yes	
Rollinsford:	✔ No ☐ Yes	
Farmington:	✔ No ☐ Yes	

e. Other?

Dover:	✔ No ☐ Yes	
Barrington:	✔ No ☐ Yes	
Rollinsford:	✔ No ☐ Yes	
Farmington:	✔ No ☐ Yes	

43.) Where is the removed snow deposited?

Dover: In the downtown Dover area parking lot. This is a big problem, space limitations limit the options.

Barrington: NA

Rollinsford: In the past behind the mills on Front Street, but not for the last 3-4 yrs.

Farmington At the landfill

44.) How is the effectiveness of the snow plowing/removal program evaluated?

Dover: Public Feedback, annual internal debriefing, Police/Fire Feedback, Chamber of Commerce (merchant's opinion); "How would you spend it?" surveys to public.

Barrington: Public Feedback, Selectmen or Administrator, Road Agent inspection.

Rollinsford: Public opinion/feedback.

Farmington: Public Feedback

II. Soil Stabilizers

1.) & 2.) & 3.) Are soil stabilizers or dust palliatives used? How often? What is used?

Dover:	✔ No ☐ Yes	Except for grading and the application of gravel on dirt roads.
Barrington:	☐ No ✔ Yes	Used two drums (20 gallons) of liquid calcium chloride on Scruton Pond Road. Many years ago used waste oil.
Rollinsford:	✔ No ☐ Yes	
Farmington:	☐ No ✔ Yes	Liquid calcium chloride on 8 mi. Of dirt roads. Most roads are 14 ft wide, and they apply 0.3 gal/yd^2. Application is made once a year in late April/early May. Applied on the following roads: Sheep Burrow Rd., Reservoir Rd., Canrod Rd., Proding Park Rd., River Rd., Waldron Cross Rd., Woodland Ac., Landfill Entrance, and Little City Rd.

III. Bridge Maintenance Practices

	Dover	Barrington	Rollinsford	Farmington
1.) Number of bridges in jurisdiction?	10	5	1 owned by town.	11
2.) How often are they inspected?	Annually by NHDOT	Bi-annually by NHDOT	Bi-annually by NHDOT; annually by Road Agent	Bi-annually by NHDOT, periodically by Road Agent
3.) How often are they repainted?	None done to date.	1 bridge in 1986	Timber bridge, not painted.	Going to replace, not repaint
4.) What methods are used to collect and dispose of old paint debris?	NA	Wire brush & scrape, debri not collected.	NA	NA
5.) Where is debris disposed of?	NA	NA	NA	NA
6.) How often is grit (sand) removed from the bridge surfaces?	Annually by street sweeping prog.	Annually	Not done. Grit falls through cracks into creek.	Washed down annually with river water...into river.

IV. Street Sweeping and Debris Removal

1.) What streets or route areas have debris swept?

Dover: All city streets.

Barrington: Side sweeping done on all Class V roads. Debri picked up at intersections and in cul-de-sacs.

Rollinsford: All streets.

Farmington: All in-town streets by contractor.

	Dover	Barrington	Rollinsford	Farmington
2.) How often are streets swept?	Annually in spring. Downtown once a wk from May to September.	Annually in spring	Annually in spring	Annually in spring

3.) Where is the swept material disposed of?	Public Works Garage at River St. Temp. Deposit at Horn St. Park & Garrison Rd.	Stockpiled behind Town Garage	Transfer Station	Landfill or land owner for fill.
4.) Is the volume or weight of the collected material recorded?	No	No	No	No
5.) Is the percentage of grit recovered calculated	No	No	No	No
And, typically, what is the recovered volume?	To be estimated	≈ 8 yd^3	≈ 40-50% volume recovered.	≈ 280 yd^3
6.) Is the collected material stockpiled?	Yes, at River St. (Public Works Garage)	Yes, at Town Garage	Yes, Transfer Station	Yes, at Landfill
If Yes, what is the ultimate use of the material?	Fill, ground cover.	Fill	Solid Fill	Backfill

IV. Catch / Sediment Basin and Culvert Maintenance

2.) Where are the major sediment/catch basins located? (attach list if available)

	Dover	Barrington	Rollinsford	Farmington
1.) Number of catch/sediment basins in jurisdiction	?	≈ 5	35	None
3.) Inspection frequency of the basins:	Complaint basis	Annually	Annually	NA
4.) Cleaning frequency of the basins:	≈ 5 year cycle	As needed	When about half full (≈ 10/yr)	NA
Where is the removed sediment disposed of?	Mixed with brush behind River St.	In area of basin	Transfer Station	NA
5.) Are outfalls and outlet structures inspected?	Complaint basis: ≈ 5yr cycle	Annually	As time permits	NA

6.) Where are the major culverts located?

Dover: See attached list.

Barrington: (see attached map) Swains Lake, Causeway on Young Road, Tolend Road, Green Hill Brook, Berry River, Pond Hill

Rollinsford: Along Route 4, Foundry Street to the river from town, Sullivan Way to stream from Hills, a couple on Main Street, gully behind Silver Street, a few culverts along the path to the River.

Farmington: All over downtown area, back country roads, problem areas.

	Dover	Barrington	Rollinsford	Farmington
7.) Do culvert outfalls have sediment traps?	Only on private property for oil/grease in parking lots	No	No	4-6 ft basin around inlet lined with rocks.
If Yes, what is their cleaning frequency?	Private owners responsibility	Outlets dug down as needed	NA	4 yr cycle
And where is the sediment disposed of?	NA	On site	NA	On site
8.) Are there vegetated waterways in the jurisdiction?	Throughout city, adjacent to Cocheco River	No	Sligo gully; Old Mill Lane; Transfer Station; Woods Road/River Rd. (privately owned)	Tamrod, Palson, Oxbow, Maderboro Road
9.) Are vegetated waterways inspected, cleaned and repaired?	Along Cocheco-inspected annually	No	Mowed over once a year	Yes
If Yes, what is the inspection frequency?	Annually	NA	Annually	Annually, checked prior to large storm
If cleaned, where is the sediment disposed of?	Turnkey	NA	NA	Landfill

V. Pesticide, Herbicide and Fertilizer Application

1.) If pesticides, herbicides or fertilizers are used in annual maintenance procedures, please complete the following tables:

Dover: Very little pesticide used, herbicide only on poison ivy on a complaint basis.

Barrington: None used

Rollinsford: None used

Farmington: None used

2.)Do you have a pesticide-herbicide management program?

Dover:	☐ No ✔ Yes	One employee certified by the State for pesticides/herbicides. No formal staging areas, just shop.
Barrington:	✔ No ☐ Yes	
Rollinsford:	✔ No ☐ Yes	
Farmington:	✔ No ☐ Yes	

VI. Construction Practices

1.) Are Best Management Practices (BMPs) used at municipal construction sites?

Dover:	☐ No ✔ Yes	
Barrington:	☐ No ✔ Yes	
Rollinsford:	✔ No ☐ Yes	Contracted construction does, municipal; construction usually not.
Farmington:	☐ No ✔ Yes	Only during construction

2.) Are the effectiveness of these practices evaluated after rainfall events?

Dover:	☐ No ✔ Yes	Post construction inspection by City Engineer; field observations by employees
Barrington:	☐ No ✔ Yes	Road Agent check
Rollinsford:	✔ No ☐ Yes	
Farmington:	☐ No ✔ Yes	Road Agent check

If yes, what were the results?

Dover:	Favorable
Barrington:	Favorable
Rollinsford:	NA
Farmington:	Favorable

If Yes, how are they evaluated? Observation

3.) Are ditches kept open by regrading or excavating?

Dover:	☐ No ✔ Yes
Barrington:	☐ No ✔ Yes
Rollinsford:	☐ No ✔ Yes
Farmington:	☐ No ✔ Yes

If Yes, how often?

Dover: Inconsistent....on a complaint basis

Barrington: As neeeded

Rollinsford: As needed

Farmington: Two to three times a year, typically last week of May, and during summer.

And where? (Attach list if available)

Dover: No formal list available

Barrington: Grading on gravel roads annually, backhoe work on ditches on 5 yr cycle

Rollinsford: No list available

Farmington: No list available

4.) Where is removed debris disposed of?

Dover: Turnkey

Barrington: List of people in the area that want it.

Rollinsford: Transfer station

Farmington: Gravel pit

5.) Are BMPs used in the ditches during this operation?

Dover: ✔ No ❑ Yes

Barrington: ✔ No ❑ Yes

Rollinsford: ✔ No ❑ Yes

Farmington: ✔ No ❑ Yes

6.) Is vegetation typically removed in the ditches during this operation?

Dover: ❑ No ✔ Yes

Barrington: ❑ No ✔ Yes Sometimes

Rollinsford: ❑ No ✔ Yes

Farmington: ✔ No ❑ Yes

7.) Are ditches reseeded after regrading?

Dover: ❑ No ✔ Yes Not always.

Barrington: ❑ No ✔ Yes Sometimes

Rollinsford: ✔ No ❑ Yes

Farmington: ✔ No ❑ Yes

8.) Are damaged roadside vegetated areas reseeded?

Dover:	☐ No ✔ Yes	As time allows.
Barrington:	☐ No ✔ Yes	
Rollinsford:	✔ No ☐ Yes	
Farmington:	☐ No ✔ Yes	Hydroseeded

9.) Are damaged roadside vegetated areas mulched?

Dover:	☐ No ✔ Yes	Sometimes.
Barrington:	✔ No ☐ Yes	
Rollinsford:	✔ No ☐ Yes	
Farmington:	☐ No ✔ Yes	Mulch included with hydroseeding

10.) Are damaged roadside vegetated areas fertilized?

Dover:	✔ No ☐ Yes
Barrington:	✔ No ☐ Yes
Rollinsford:	✔ No ☐ Yes
Farmington:	✔ No ☐ Yes

APPENDIX D. Dover Salt and Plow Routes, and Structures Requiring Maintenance

NORTHSIDE SALT ROUTE

EQUIPMENT: DRIVER:

PRIORITY 1	PRIORITY 2	PRIORITY 3	
HENRY LAW AVE to WASHINGTON ST	SIXTH ST TO T/L	PROSPECT ST	CRESTVIEW DR
WASHINGTON ST to MAIN ST	COUNTY FARM RD	CEDARBROOK DR	OLD ROLLINSFORD RD
MAIN ST to CENTRAL AVE	COUNTY FARM CROSS RD	BROOKLINE AVE	VARNEY ST
CENTRAL AVE NORTH to MIRACLE MILE	WATSON RD	MINERAL PARK DR	HIGH RIDGE DR
MIRACLE MILE NORTH TO CHILIS	TOLEND RD	PLEASANTVIEW CIR	OLD ENGLISH VILLAGE
CHILIS NORTH TO PORTLAND GLASS	COLUMBUS AVE	UPPER FACTORY RD	MORIN ST
LEFT AT PORTLAND GLASS TO 16B N	WHITTIER ST	FRENCH CROSS RD	LAKE ST AREA
RT 16B NORTH TO T/L	GLENWOOD AVE	END OF TOLEND RD	WILLAND AVE
TURN AROUND	HORNE ST	GLENHILL RD	STRAFFORD RD AREA
GO TO BACK TO PORTLAND GLASS	GROVE ST	MT. VERNON ST	OLD ROCHESTER RD
GO SOUTH TO MIRACLE MILE	FOURTH ST	NEW YORK ST	CRANBROOK LN
MIRACLE MILE TO CENTRAL AVE	THIRD ST	FIFTH ST	MAPLEWOOD AVE
CENTRAL AVE TO LOWER SQUARE	SECOND ST	LINCOLN ST	COLONIAL PARK
PORTLAND AVE	FIRST ST	SCHOOL ST	LONGHILL RD
OAK ST	ST JOHNS ST	MECHANIC ST	VARNEY RD
BROADWAY	ATLANTIC ST	REDDEN ST	BLACKWATER RD
COCHECO ST	COUNTRY CLUB EST DR	HILLCREST DR	VENTURE DR
ROGERS ST		BARTLETT ST	REYNERS BROOK DR
WASHINGTON ST		PLAZA DR	FIELDSTONE DR
CHESTNUT ST		NORTHWAY CIR	FOREST ST AREA
GREEN ST		BARRY ST	ELMWOOD AREA
		CRESCENT AVE	FAIRWAY DR
		GLENCREST AVE	

SUPERVISOR COMMENTS

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NORTHSIDE SALT ROUTE

EQUIPMENT: DRIVER:

PRIORITY 1	PRIORITY 2	PRIORITY 3	
HENRY LAW AVE to WASHINGTON ST	SIXTH ST TO T/L	PROSPECT ST	CRESTVIEW DR
WASHINGTON ST to MAIN ST	COUNTY FARM RD	CEDARBROOK DR	OLD ROLLINSFORD RD
MAIN ST to CENTRAL AVE	COUNTY FARM CROSS RD	BROOKLINE AVE	VARNEY ST
CENTRAL AVE NORTH to MIRACLE MILE	WATSON RD	MINERAL PARK DR	HIGH RIDGE DR
MIRACLE MILE NORTH TO CHILIS	TOLEND RD	PLEASANTVIEW CIR	OLD ENGLISH VILLAGE
CHILIS NORTH TO PORTLAND GLASS	COLUMBUS AVE	UPPER FACTORY RD	MORIN ST
LEFT AT PORTLAND GLASS TO 16B N	WHITTIER ST	FRENCH CROSS RD	LAKE ST AREA
RT 16B NORTH TO T/L	GLENWOOD AVE	END OF TOLEND RD	WILLAND AVE
TURN AROUND	HORNE ST	GLENHILL RD	STRAFFORD RD AREA
GO TO BACK TO PORTLAND GLASS	GROVE ST	MT. VERNON ST	OLD ROCHESTER RD
GO SOUTH TO MIRACLE MILE	FOURTH ST	NEW YORK ST	CRANBROOK LN
MIRACLE MILE TO CENTRAL AVE	THIRD ST	FIFTH ST	MAPLEWOOD AVE
CENTRAL AVE TO LOWER SQUARE	SECOND ST	LINCOLN ST	COLONIAL PARK
PORTLAND AVE	FIRST ST	SCHOOL ST	LONGHILL RD
OAK ST	ST JOHNS ST	MECHANIC ST	VARNEY RD
BROADWAY	ATLANTIC ST	REDDEN ST	BLACKWATER RD
COCHECO ST	COUNTRY CLUB EST DR	HILLCREST DR	VENTURE DR
ROGERS ST		BARTLETT ST	REYNERS BROOK DR
WASHINGTON ST		PLAZA DR	FIELDSTONE DR
CHESTNUT ST		NORTHWAY CIR	FOREST ST AREA
GREEN ST		BARRY ST	ELMWOOD AREA
		CRESCENT AVE	FAIRWAY DR
		GLENCREST AVE	

SUPERVISOR COMMENTS

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SOUTHSIDE SALT ROUTE

EQUIPMENT: DRIVER:

PRIORITY 1	PRIORITY 2	PRIORITY 3	
HENRY LAW TO HANSON ST	ARCH ST	BROWNING DR	S. PINE ST
HANSON ST TO CENTRAL AVE	RUTLAND ST	TENNYSON DR	CHURCH ST
CENTRAL AVE NORTH TO WASHINGTON	CATARACT AVE	BACK RD	MIDDLE ST
WASHINGTON TO MAIN ST	ALUMNI DR	BRICKYARD ESTATES	KIRKLAND ST
TURN LEFT AT THE FOUNTAIN	MAST RD	DOVER NECK RD	ATKINSON ST
CENTRAL AVE SOUTH TO STARK AVE	MAST RD EXT	EVANS DR	ST. THOMAS ST
STARK AVE TO DOVER PT RD	GARRISON RD	OLD DOVER PT RD	ELM ST
DOVER PT RD TO WILLIAMS CADILLAC	HENRY LAW AVE	END OF CUSHING RD	WALNUT ST
RETURN TO CENTRAL AVE	COURT ST	HAWTHORNE RD	BELKNAP ST
CENTRAL AVE SOUTH TO DURHAM RD	MIDDLE RD	HUBBARD RD	TOWLE AVE
DURHAM RD TO MAST RD	SPRUCE LN TO BACK RIVER	BRIARWOOD LN	WOODMAN PK AREA
RETURN TO LOWER SQUARE	TUTTLE LN	APPLEVALE AREA	SUNSET DR
LOCUST ST	TOFTREE LN	ELLIOT CIRCLE	FAIRFIELD DR
SILVER ST	CUSHING LN	GOVERNOR SAWYER LN	BELLAMY EXT
BACK RIVER RD	SPUR RD	BEECH RD	OLD LITTLEWORTH RD
PISCATAQUA RD	DOVER PT BY NEWICKS	LONG MEADOW RD	OLD STAGE RD
SPRUCE LN	COTE DR	BIRCHWOOD PL	RICHARDSON DR
MAST RD	HOMESTEAD LN	RENAUD AVE	WESTWOOD CIRCLE
BELLAMY RD	PINEVIEW DR	CHARLES ST	PROGRESS DR
INDUSTRIAL PARK DR	PEARSON DR	MILL ST	SUMNER DR
CROSBY RD	ROBERTA DR	WATSON ST	LISA BETH CIRCLE
BACK RIVER TO MAST RD	ROBERTS RD	WATSON LN	REDDEN GARDENS
SPRUCE LN TO DURHAM RD	LANDING WAY	ELMVIEW CIR	SPRUCE DR
	NEW BELLAMY LN	LOCKE ST	PARTRIDGE LN
	RIVERSIDE DR	UNION ST	ROBINWOOD AVE

SUPERVISOR COMMENTS

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PLOW RUNS

DATE: SUPV:

RUN LOCATION	TRUCK NO.	DRIVER	HELPER	COMMENTS
CITY ROUTE				
APPLEVALE	79	LAROCHELLE		
BACK RIVER	112	LEMEUIX		
CENTRAL AVE NORTH	54	HEALY		
CENTRAL AVE SOUTH	77	McLEAN	GREGOIRE	
COLONIAL PARK	20	WAGNER	WILSON	
COUNTY FARM	71	GREEN	FREEMAN	
DOVER PT RD	60	WHITE	HUGHES	
FISHER	76	PELLETIER		
INDUSTRIAL PK	78	TRUDELL	LABREQUE	
MORNINGSIDE AREA	52	FLANAGAN		
MT VERNON	70	ALONZI	REARDON	
NEW YORK ST	73	TURCOTTE		
PORTLAND AVE	61	DEWS		
WASHINGTON	75	SNOW		
CONTRACTOR				
HENRY LAW/BACK RD	GRADER	GUPTILL THEN OMI	10 WHEEL	
TOLEND ROAD	6W	AYER-JR		
DEAD ENDS/4X4				
1) THOMPSON LN	45 4X4	CORMIER		
2) SCHOOL ST	89 4X4	THORPE		
3) STP	64	CHAPMAN		
4) WATER	21	PHIPPS		
5) BACK RIVER	51	PRATT, J		
6) WELLS	4X4	FAUCHER		
SIDEWALKS				
CENTRAL AVE	UNILOADER	TALON		
DOVER - NORTH	83	REED		
DOVER - SOUTH	82	PILWESKI		

SNOW REMOVAL #1

1	ST. MARY'S SCHOOL	along both sides of school
2	ANGLE ST	one side near wall
3	UNION ST	Central to Court 1 side
4	TRAKEY ST	Central to Locust NORTH side only
5	SILVER ST	Central to Locust BOTH SIDES
6	LOCUST ST	Silver to Washington
7	CENTRAL AVE	On Nelson St to Day Care around CITY HALL
8	WALNUT ST	to Washington St
9	ST. THOMAS ST	near Telephone building and the Jr. High School

SNOW REMOVAL #2

1	ST. MARY'S CHURCH	Third St side
		Include front of old B&M building along Fourth St
2	FOURTH ST	Chestnut to Dunkin' Donuts
		also near Temple
3	FIFTH ST	Chestnut to Central
4	NEW YORK ST	Central to Park St
5	SIXTH ST PARKING	Central to Chestnut
6	BROADWAY	Central to St. Johns
7	ST. JOHNS	Both sides
		Durell St to corner
8	PORTLAND ST	Main St to Mechanic St
9	MECHANIC ST	Portland St to School St
		School St to Main St

SNOW REMOVAL #3

1	CLAROSTAT	Both sides to River
		STAY AWAY FROM LIGHTS
2	YOUNG ST	Both sides
3	PORTLAND ST	Both sides to Cocheco St
4	ORCHARD ST (near Spartan)	Both sides
		Remove snow in small parking lot
		Remove snow behind Spartan in alley way
5	CENTRAL AVE	Liquor Store Parking Lot
6	FAYETTE ST	Near Post Office
7	GREEN ST	Near Post Office

BLOWER SNOW ROUTE

1	HENRY LAW	To Lower Washington St
2	MAIN ST	
3	CENTRAL AVE	Ham St south to Trakey St - BOTH SIDES
4	WASHINGTON ST	Pick up pile at Christie Carpets Central Ave to RR tracks
5	SECOND ST	
6	THIRD ST	
7	CHESTNUT ST	
8	FIRST ST	

APPLEVALE PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
KEELTY ST	
LOCKE ST	
S. PINE ST	
CENTRAL > COURT	
UNION ST	
ELLIOT PARK	NOTE: CLEAN CORNER AT BACK SIDE ELLIOTT
GOV. SAWYER LN	PARK
HAWTHORNE RD	
HUBBARD RD	
BRIARWOOD LN	
MIDDLEBROOK RD	
KENT AVE	
APPLEVALE DR	
WINSTON AVE	
SALEM AVE	
MIDDLE ST	
CHURCH ST	
ANGLE ST	
KIRKLAND ST	
NEWPORT ST	

SUPERVISOR COMMENTS

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BACK RIVER ROAD PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
CENTRAL AVE	STARK AVE TO DURHAM RD
DURHAM RD	
BACK RIVER RD	
MAST RD	PRUVEN CONCRETE TO BACK RIVER RD
SPRUCE LN	MAST RD TO GARRISON RD
GARRISON RD	
PISCATAQUA RD	
DREW RD	
GOLD POST RD	

SUPERVISOR COMMENTS

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CENTRAL AVENUE NORTH PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
MAIN ST	
CENTRAL AVE	MAIN ST TO CHILI'S INTERSECTION
CENTRAL AVE	CHILI'S TO WAASHINGTON ST
CHESTNUT ST	
FIRST ST	
SECOND ST	
THIRD ST	
FOURTH ST	CENTRAL AVE TO FIFTH ST
FIFTH ST	
LINCOLN ST	
GROVE ST	SIXTH TO END

SUPERVISOR COMMENTS

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CENTRAL AVENUE SOUTH PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
MAIN ST	
CENTRAL AVE	SECOND ST TO STARK AVE
STARK AVE	
SILVER ST	
LOCUST ST	
WALNUT ST	
LONGMEADOW RD	
BEECH RD	
WOODLAND RD	
RENAUD AVE	
SHAMROCK LN	
KEATING DR	
HAYES LN	
BIRCHWOOD PL	
SMITH RD	
GREEN ST	
FAYETTE ST	

SUPERVISOR COMMENTS

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COLONIAL PARK PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
AUBURN ST	
SHERMAN ST	
LAKE ST	
GAGE ST	
OLD ROCHESTER RD	
OXBOW LN	
PINECREST LN	
WILLARD RD	
WILLAND AVE	
STRAFFORD RD	AT BACK CORNER PUSH BACK TO DRIVEWAYS
WELLINGTON RD	
MAPLEWOOD AVE	BE CAREFUL OF CORNER FOR WATER DRAIN
CRANBROOK LN	
ALLEN ST	
PHILLIP ST	
SHAWNEE LN	
CHEYENNE ST	
COMMANCHEE ST	
MORIN ST	
COLONIAL PARK NORTH	
OLD ENGLISH VILLAGE	
NEW ROCHESTER RD	FROM CHILI'S TO PORTLAND GLASS

SUPERVISOR COMMENTS

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COUNTY FARM ROAD PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
SIXTH ST	WHITTIER ST TO ROCHESTER T/L
COUNTY FARM RD	WINGS: WATCH FOR SMH IN DRAINAGE DITCHES
ERIC DR	
COUNTY FARM CROSS RD	
LONG HILL RD	SIXTH ST TO RTE 16
LONG HILL RD EXT	TURN AROUND AWAY FROM DRIVEWAY & PLOW WIDE
FIELDSTONE DR	
VARNEY RD	
VARNEY RD EXT	
BLACKWATER RD	RTE 16B TO ROCHESTER T/L
REYNERS BROOK DR	
VENTURE DR	

SUPERVISOR COMMENTS

1] AT WEEDEN DEVELOPMENT PUSH SNOW INTO ROAD

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DOVER POINT ROAD PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
CUSHING RD	
SPUR RD	
BELLAMY LN	
OLD BELLAMY LN	
AYER'S LN	
OAK LN	
HILTON RD	
OLD DOVER PT RD	
TOFTREE LN	
HILTON DR	
WENTWORTH TERR	
COTE DR	
HOMESTEAD LN	
PINEVIEW DR	DON'T CLOG DRAINAGE DITCH
PEARSON DR	
BELANGER DR	
ROBERTS RD	
LANDING WAY	
ROBERTA DR	
RIVERSIDE DR	
EVANS DR	

SUPERVISOR COMMENTS

1] IN AN EMERGENCY YOU MAY BE ASKED TO PLOW OLD GEN'L SULLIVAN BRG

2] CHECK CUTTING EDGES EVERY 2 HOURS

3] CHECK MIDDLE AND BACK ROAD

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FISHER STREET PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
TOWLE AVE	
WOODMAN PARK	COMPLETE BEFORE 7AM -- NOTIFY SUPV IF UNABLE TO COMPLETE
PARKER ST	
CLIFFORD ST	
WOODMAN PARK DR	
RUTLAND ST	
ABBEY LN	
CATARACT AVE	
FISHER ST	CENTRAL AVE TO BELLAMY RD
ELM ST	
HAMILTON ST	
BELKNAP ST	
SUMMER ST	
TRAKEY ST	
SPRING ST	
CHARLES ST	CENTRAL AVE TO SEWER PUMP STATION
MILL ST	BE CAREFUL OF CURBS AT SAWYERS

SUPERVISOR COMMENTS

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HENRY LAW and BACK ROAD PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
HENRY LAW AVE	
COURT ST	
BROWNING DR	
TENNYSON AVE	
PENNY LN	
ELMVIEW CIR	
McKONE LN	
HANSON AVE	
HANSON ST	
MULLIGAN DR	
BACK RD	
MIDDLE RD	
ISAAC LUCAS CIR	
BRICKYARD DR	
RUTHIES RUN	
DOVER NECK RD	
TUTTLE LN	

SUPERVISOR COMMENTS

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INDUSTRIAL PARK PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
PROGRESS DRIVE	
SUMNER DRIVE	
INDUSTRIAL PK RD	
CROSBY RD	
FARADAY DR	
OLD STAGE RD	
RICHARDSON DR	
WESTWOOD CIR	
CONCORD WAY	
OLD LITTLEWORTH RD	
BELLAMY EXT	
BEVERLY LN	
W. KNOX MARSH RD	
WESTERN AVE	
WESTGATE	
MARTHAS WAY	
HARTSWOOD DR	NOTIFY SUPV. IF PLUGS UP AT END
FAIRFIELD DR	
SUNSET DR	ALSO DO DEAD END OFF OF SUNSET DR
BELLAMY RD	
LISA BETH CIR	
ALUMNI DR	

SUPERVISOR COMMENTS

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MORNINGSIDE AREA PLOW ROUTE

DATE:

DRIVER:	DRIVER:	
EQUIPMENT:	EQUIPMENT:	
ROUTE	ROUTE	NOTES/COMMENTS
SYLVAN DR	MAST RD EXT	
ADELLE DR	SHADY LN	
PONDVIEW LN	BIRCH DR	
GRADY LN	HEMLOCK CIR	
PARTRIDGE LN	AUSTIN DR	
ROBINWOOD AVE	LINDA DR	
SPRUCE DR	RIVERDALE AVE	
JAMES ST	ARBOR DR	
KELLY DR	MERIDIAN DR	
RAINBOW DR	MORNINGSIDE DR	
BERKSHIRE LN	SHADOW DR	
TANGLEWOOD DR	SHAWS LN	
GREENFIELD DR		
SPRUCE LN EXT		
McKENNA ST		

SUPERVISOR COMMENTS

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MORNINGSIDE AREA PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
SYLVAN DR	
ADELLE DR	
PONDVIEW LN	
GRADY LN	
MAST RD EXT	
PARTRIDGE LN	
ROBINWOOD AVE	
SPRUCE DR	
JAMES ST	
SHADY LN	
KELLY DR	
RAINBOW DR	
BERKSHIRE LN	
TANGLEWOOD DR	
BIRCH DR	
HEMLOCK CIR	
AUSTIN DR	
LINDA DR	
RIVERDALE AVE	
ARBOR DR	
MERIDIAN DR	
MORNINGSIDE DR	
SHADOW DR	
SHAWS LN	
GREENFIELD DR	

SUPERVISOR COMMENTS

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MT. VERNON STREET PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
MT. VERNON ST	
GLENWOOD AVE	
NORTHAM DR	
MILK ST	
GROVE ST	
CHESLEY ST	
ABBOTT ST	
ROOSEVELT DR	
LOWELL AVE	
PAGE ST	
ASH ST	
MAPLE ST	
HOUGH ST	
BARTLETT ST	
HILLCREST DR	
LOGAN AVE	
HORNE ST	
WEDGEWOOD RD	
OAK HILL DR	
REDDEN ST	NOTE: BE CAREFUL OF PETROFF LAWN
GLENCREST DR	NOTE: BE CAREFUL OF LAWNS
CRESCENT AVE	NOTE: BE CAREFUL OF LAWNS
HORNE ST SCHOOL	
RESERVOIR ST	
SMITH WELL RD	
BARRY ST	

SUPERVISOR COMMENTS

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NEW YORK STREET PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
PIERCE ST	
PREBLE ST	
NEW YORK ST	
EAST ST	
DOVER ST	
PARK ST	
HAM ST	
EAST CONCORD	
BAKER ST	
EVERETT ST	
FREEMAN CT	
COOLIDGE AVE	
PEARL ST	
FLORENCE ST	
ELA ST	
FLORAL AVE	
HIGH RIDGE DR	
VARNEY ST	NOTE: TO LEFT AND TO RICHARD'S HOUSE
BROADWAY	
OAK ST	CENTRAL AVE TO BROADWAY SECTION
HILL ST	
TWOMBLY ST	
OLD ROLLINSFORD RD	

SUPERVISOR COMMENTS

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PORTLAND AVENUE PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
PORTLAND AVE	CENTRAL AVE TO OAK ST SECTION
PORTLAND ST	
ATLANTIC AVE	TO COUNTRY CLUB RD
COCHECO ST	
BROADWAY	
ROGERS ST	
ESSEX ST	
FOREST ST	
HANCOCK ST	
ST. JOHN'S ST	
OAK STREET	TO BROADWAY
THREE RIVERS FARM RD	
COUNTRY CLUB EST DR	
CROSS ST	
FAIRVIEW AVE	
ELMWOOD AVE	
COUNTRY CLUB RD	TO STONE WALL
FAIRWAY MEADOWS	
YOUNG ST	
WATER ST	
LOWER WASHINGTON ST	FROM MAIN ST TO END OF WASHINGTON

SUPERVISOR COMMENTS

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TOLEND ROAD PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
TOLEND RD	
OLD TOLEND RD	
WHITTIER ST	FROM TOLEND TO GLENWOOD AVE
GLENWOOD AVE	FROM WHITTIER TO SIXTH ST
CRESTVIEW DR	OPEN CUL DE SAC THEN 4 WHEEL DRIVE
WILBROD AVE	WILL COMPLETE
PLAZA DR	
NORTHWAY CIR	DOES NOT INCLUDE IN FRONT OF OFFICE
GLENHILL RD	
ROCHESTER NECK RD	TO BROX
GLENHILL RD	FROM TOLEND RD TO T/L
FRENCH CROSS RD	
DEAN DR	
WATSON RD	FROM TOLEND TO COUNTY FARM RD
UPPER FACTORY RD	
COLUMBUS AVE	

SUPERVISOR COMMENTS

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WASHINGTON STREET PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
ARCH STREET	
W. CONCORD ST	
RICHMOND ST	
LEXINGTON ST	
CUSHING ST	
FOLSOM ST	
NELSON ST	
ATKINSON ST	
BELKNAP ST	FROM WASHINGTON TO SILVER
WASHINGTON ST	
HIGHLAND ST	
PROSPECT ST	
SNOW'S COURT	
FOURTH ST	TO INTERSECTION OF FIFTH ST
KENNEDY CIRCLE	
ALBERTA ST	
BROOKLINE AVE	
PLEASANT VIEW CIR	
MINERAL PARK DRIVE	
AVON AVE	
HAMPSHIRE CIRCLE	
WHITTIER STREET	
CEDABROOK DR	
ST THOMAS ST	
HALE ST	

SUPERVISOR COMMENTS

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CONTRACTOR PARKING LOT PLOW ROUTES

CONTRACTORS TO PROVIDE TIME IT TAKES TO CLEAR EACH LOT.
SUPERVISIOR TO CALL ALL CONTRACTORS
WHEN WE SCRAPE -- THEY SCRAPE

AMERICAN LIGHTNING ROD

NOTE: RED 1-TON HAS SANDER IF NEEDED

1) DOVER HIGH SCHOOL - BELLAMY PARKING LOT
2) DURHAM RD FIRE STATION
3) GARRISON SCHOOL
4) ARENA

DAN AYER

1) LIBRARY LOT
2) WOODMAN PARK
3) THIRD ST
4) CHESTNUT ST @ TONY'S
5) THIRD ST @ SENIOR CENTER
6) CLEAN ISLANDS AROUND FOUNTAIN (LOADER)
7) LOWER SQUARE (LOADER)

LIZOTTE

NOTE: 45 MINUTES TO 1 HOUR TO ARRIVE

1) ORCHARD ST and FIREHOUSE RESTAURANT
2) FIRST ST
3) LOCUST ST
4) CITY HALL (2 LOTS)
5) BELKNAP LOT (LIQUOR STORE)
6) COURT HOUSE @ ST. THOMAS ST
7) POST OFFICE

4-J CONSTRUCTION

1) PORTLAND ST
2) SCHOOL ST (LOWER LOT ALSO)
3) BROADWAY FIRE STATION
4) HORNE ST
5) BUTTERFIELD (FRONT and BACK)
6) RIVER ST
7) ISLANDS AT GLENWOOD AVE
8) WATER ST

SUPERVISOR COMMENTS

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[1] - THOMPSON LANE 4X4 PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
THOMPSON LN	
PAUL ST	
WALLINGFORD ST	
NILE ST	
GEORGE ST	
SONNETT ST	
WENTWORTH ST	OFF OF COURT ST
NILES DR	
FEDERAL ST	
MONROE ST	OFF OF LOCUST ST
FERNS CT	OFF OF FOLSOM ST
WILLIAMS ST	
BEECH RD	DEAD END
WOODLAND AVE	DEAD END
McKONE LN	
WATSON LN	DEAD END
WATSON ST	DEAD END

SUPERVISOR COMMENTS

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[2] SCHOOL STREET 4X4 PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
SCHOOL ST	
MECHANIC ST	
ESSEX ST	AT DEAD END
GRANITE ST	
DANBURY CT	
COUNTRY CLUB EST	PLOW CUL-DE-SACS
ROSE ST	
HIGH RIDGE DR	
FREEMAN'S CT	
N. PINE ST	
WINTER ST	
CEDAR ST	
MERRY ST	
RIDGE ST	
HALL ST	
GILMAN ST	
WILLAND POND RD	
NEWTON ST	
SULLIVAN DR	
EARLE ST	
COLONIAL PARK	PLOW CUL-DE-SACS
AVON ST	
IONA AVE	
ARCOLA ST	

SUPERVISOR COMMENTS

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[3] STP 4X4 PLOW ROUTE

EQUIPMENT: DRIVER:

STREET and LOCATION	NOTES/COMMENTS
COCHECO ST STATION	
STRAFFORD STATION	
CRANBROOK STATION	
CRANBROOK CUL-DE-SAC	
MILL ST	FROM CHARLES ST STA TO END
SPRUCE DR STATION	
CUSHING ST STATION	
BOSTON HARBOR STATION	ALSO DEAD END ACROSS FROM STA
BOSTON HARBOR RD	
LEIGHTON WAY	
HILTON DR	
WENTWORTH TERRACE	
DEAD END ACROSS FROM BELANGER DR	
RIVERSIDE DR	

SUPERVISOR COMMENTS

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[4] WATER 4X4 PLOW ROUTE

EQUIPMENT: DRIVER:

STREET and LOCATION	NOTES/COMMENTS
HORNES COURT	
ASH STREET EXT	
MAPLE STREET EXT	
DEAD END OFF REDDEN STREET	
SNOWS AVENUE	
HULL AVE	IF LOADER NEEDED NOTIFY SUPV.
END OF BARRY STREET	
CRESTVIEW CUL-DE-SAC'S	
VALLEY STREET (OFF GLENWOOD AVE)	
DOWALIBY COURT (OFF WHITTIER ST)	
AUTUMN STREET (OFF SIXTH ST)	
ERIC DRIVE CUL-DE-SAC (COUNTY FARM RD)	
DEAD END TOWARDS OLD COVERED BRIDGE	
COLD SPRINGS ROAD	
MESERVE ROAD	
BACK RIVER RD - VETERANS BUILDING	PLOW AFTER STORM
OLD COLONY ROAD	
NUTE ROAD	
EVANS DRIVE CUL-DE-SAC	
CIRCLE AT BRITTANY PARK	
END OF MORIN ST	
PINECREST OFF TRAFFIC CIRCLE	

SUPERVISOR COMMENTS
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[5] BACK RIVER 4X4 PLOW ROUTE

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
McKENNA DR	
SHADY LN	
SPRUCE LN EXT	RESIDENT TAKES CARE OF LEFT SIDE
RABBIT RD	
OLD GARRISON RD	FROM BAYVIEW TO DAVE HILL'S HOUSE
BAYVIEW RD	TURN AROUND AT THE "Y"
SPRUCE DR	AT DEAD END
PARTRIDGE LN	AT CUL-DE-SAC
SYLVAN DR	AT CUL-DE-SAC
ADELLE DR	AT CUL-DE-SAC
SUNSET DR	AT DEAD END
HARTSWOOD DR	AT END
OLD CATARACT AVE	AT DEAD END
W. KNOX MARSH RD	

SUPERVISOR COMMENTS

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[6] WELLS 4X4 PLOW ROUTE

EQUIPMENT: DRIVER:

WELL NAME and LOCATION		NOTES/COMMENTS
BOUCHARD WELL	FRENCH CROSS RD	
CALDERWOOD WELL	GLENHILL RD	
CAMPBELL WELL	GLENHILL RD	
CUMMINGS WELL	SMITH WELL RD	
GRIFFIN WELL	MAST RD AT 2ND ENTRANC	
HUGHES WELL	OLD STAGE RD	
IRELAND WELL	MAST RD AT 1ST ENTRANCE	
LOWELL AVE STATION	LOWELL AVE	
SMITH WELL	SMITH WELL RD	
SUPERVISOR COMMENTS		
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GRADER PLOW ROUTE

EQUIPMENT: DRIVER:

STREET and LOCATION	NOTES/COMMENTS
CENTRAL AVE	
ROUTE 16 & 16B	
DURHAM RD	
STARK AVE	
SILVER ST	
PORTLAND AVE	
BROADWAY	
CHESTNUT ST	
WASHINGTON ST	
BELLAMY RD	
SIXTH ST	

SUPERVISOR COMMENTS

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GRAVEL ROADS PLOW ROUTE

EQUIPMENT: DRIVER:

STREET and LOCATION		NOTES/COMMENTS
BOSTON HARBOR RD	ACROSS FROM DMV	
COLD SPRINGS RD	OFF OF BELLAMY RD	
COVERED BRIDGE LN	OFF OF GLENHILL RD	
IONA AVE	OFF OF BROOKLINE AT FOURTH ST	
MCKONE LN	OFF HENRY LAW AVE	
OLD GARRISON RD	OFF OF BAYVIEW DR	
RABBIT RD	OFF OF BACK RIVER RD	
THOMPSON LN	OFF OF HENRY LAW AVE	
THREE RIVERS FARM RD	OFF OF GULF RD	
VALLEE ST	OFF OF GLENWOOD AVE	
WATSON LN	OFF OF WATSON ST	

SUPERVISOR COMMENTS

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NORTHSIDE SIDEWALK PLOW ROUTE

EQUIPMENT: DRIVER:

HENRY LAW AVE	FROM RIVER ST TO MAIN ST (RIGHT SIDE)
MAIN ST	FROM HENRY LAW AVE TO PORTLAND ST (RIGHT SIDE)
WASHINGTON ST	IN FRONT OF CLAROSTAT BLDG
YOUNG ST	
PORTLAND ST	IN FRONT OF PRINT SHOP
SCHOOL ST	
TURN AROUND	
ST JOHNS ST	FROM PORTLAND AVE TO BROADWAY (BOTH SIDES)
BROADWAY	FROM CENTRAL AVE TO OAK ST (LEFT SIDE)
TURN AROUND	
HAM ST	FROM BROADWAY TO CENTAL AVE (RIGHT SIDE)
HAM ST	FROM CENTRAL AVE TO PARK ST (RIGHT SIDE)
CENTRAL AVE	FROM HAM ST TO OAK ST (RIGHT SIDE)
OAK ST	FROM CENTRAL AVE TO PARK ST (RIGHT SIDE)
TURN AROUND	
CENTRAL AVE	FROM RESERVOIR ST TO CHESTNUT ST (RIGHT SIDE)
NEW YORK ST	FROM CENTRAL AVE TO BROADWAY (LEFT SIDE)
PIERCE ST	FROM BROADWAY TO CENTRAL AVE (RIGHT SIDE)
FOURTH ST	FROM DUNKIN DONUTS TO CHESTNUT ST (RIGHT SIDE)
FOURTH ST	FROM CHESTNUT ST TO ARCOLA ST (LEFT SIDE)
TURN AROUND	
FIFTH ST	FROM CONDOS TO CENTRAL AVE (LEFT SIDE)
SIXTH ST	FROM CENTRAL AVE TO GROVE ST (LEFT SIDE)
SIXTH ST	FROM GROVE ST TO HORNE ST (RIGHT SIDE)
HORNE ST	FROM SIXTH ST TO GLENCREST AVE (LEFT SIDE)
HORNE ST	FROM CRESCENT AVE TO GLENWOOD AVE (RIGHT SIDE)
GLENWOOD AVE	FROM HORNE ST TO WHITTIER ST (LEFT SIDE)
TURN AROUND	
GLENWOOD AVE	FROM HORNE ST TO CENTRAL AVE (RIGHT SIDE)
MIRACLE MILE	FROM W D HOSPITAL ENT TO MERCHANTS BANK ENT (RIGHT SIDE)
MIRACLE MILE	OPPOSIDE SIDE FROM BLOCKBUSTER ENT TO ASH ST (RIGHT SIDE)
ASH ST	FROM CENTRAL AVE TO HORNE ST (LEFT SIDE)
CHESTNUT ST	FROM CENTRAL AVE TO WASHINGTON ST (RIGHT SIDE)
FIRST ST	FROM CHESTNUT ST TO CENTRAL AVE (BOTH SIDES)
SECOND ST	FROM CHESTNUT ST TO CENTRAL AVE (BOTH SIDES)

SUPERVISOR COMMENTS

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SOUTHSIDE SIDEWALK PLOW ROUTE

EQUIPMENT: DRIVER:

HANSON ST	FROM HENRY LAW TO CENTRAL AVE (RIGHT SIDE)	
CENTRAL AVE	FROM SILVER ST TO STARK AVE (RIGHT SIDE)	
STARK AVE	FROM CENTRAL AVE TO STORE 24 (RIGHT SIDE)	TURN AROUND
CENTRAL AVE	FROM STARK AVE TO DURHAM RD (RIGHT SIDE)	
BACK RIVER RD	FROM MILL ST TO GARRISON RD (LEFT SIDE)	
GARRISON RD	FROM BACK RIVER RD TO GARRISON SCHOOL (LEFT SIDE)	
GARRISON RD	FROM GARRISON SCHOOL TO AUSTIN DR (RIGHT SIDE)	TURN AROUND
BACK RIVER RD	FROM GARRISON RD TO SPRUCE LN (LEFT SIDE)	TURN AROUND
DURHAM RD	FROM CENTRAL AVE TO ALUMNI DR (RIGHT SIDE)	
DURHAM RD	FROM ALUMNI DR TO MAST RD (LEFT SIDE)	
CATARACT AVE	FROM CENTRAL AVE TO BELLAMY RD (LEFT SIDE)	TURN AROUND
BELLAMY RD	FROM CATARACT AVE TO DURHAM RD (LEFT SIDE)	TURN AROUND
BELLAMY RD	FROM CATARACT AVE TO KNOX MARSH RD (RIGHT SIDE)	
TUNNEL ENTRANCE	AT THE END OF W. KNOX MARSH RD	
SPAULDING TP	TURNPIKE TO SILVER ST	
TUNNEL ENTRANCE	END OF SILVER ST EXTENSION	
SILVER ST	FROM OVERPASS TO TOWLE AVE (RIGHT SIDE)	
TOWLE AVE	FROM SILVER ST TO CLIFFORD ST (LEFT SIDE)	TURN AROUND
SILVER ST	FROM TOWLE AVE TO RUTLAND ST (RIGHT SIDE)	
RUTLAND ST	FROM SILVER ST TO FISHER ST (LEFT SIDE)	
RUTLAND ST	FROM PARKER ST TO CATARACT AVE (RIGHT SIDE)	TURN AROUND
SILVER ST	FROM RUTLAND ST TO CENTRAL AVE (RIGHT SIDE)	
SILVER ST	FROM CENTRAL AVE TO TEXACO STATION (RIGHT SIDE)	TURN AROUND
ARCH ST	FROM SILVER ST TO WASHINGTON ST (RIGHT SIDE)	
WASHINGTON ST	FROM ARCH ST TO WHITTIER ST (RIGHT SIDE)	
WHITTIER ST	FROM WASHINGTON ST TO HAMPSHIRE CIR (RIGHT SIDE)	TURN AROUND
WASHINGTON ST	FROM ARCH TO LEXINGTON ST (RIGHT SIDE)	
LEXINGTON ST	FROM WASHINGTON ST TO SILVER ST (RIGHT SIDE)	TURN AROUND
WASHINGTON ST	FROM LEXINGTON ST TO CUSHING ST (RIGHT SIDE)	
CUSHING ST	FROM WASHINGTON ST TO SILVER ST (LEFT SIDE)	TURN AROUND
WASHINGTON ST	FROM CUSHING ST TO WALNUT ST (RIGHT SIDE)	
WALNUT ST	FROM WASHINGTON TO ST THOMAS ST (BOTH SIDES)	
WASHINGTON ST	FROM WALNUT ST TO LOCUST ST (RIGHT SIDE)	
LOCUST ST	FROM WASHINGTON ST TO ST THOMAS ST (RIGHT SIDE)	
LOCUST ST	FROM ST THOMAS ST TO WASHINGTON ST (RIGHT SIDE)	TURN AROUND
LOCUST ST	FROM ST THOMAS ST TO PUBLIC LIBRARY (RIGHT SIDE)	
LOCUST ST	WALKWAY TO LIBRARY FRONT DOOR	
LOCUST ST	FROM LIBRARY TO FISHER ST (RIGHT SIDE)	
FISHER ST	FROM LOCUST ST TO RUTLAND ST (RIGHT SIDE)	TURN AROUND
LOCUST ST	FROM FISHER ST TO CENTRAL AVE (RIGHT SIDE)	
TRAKEY ST	FROM CENTRAL AVE TO LOCUST ST (RIGHT SIDE)	
COURT ST	FROM UNION ST TO CENTRAL AVE (RIGHT SIDE)	
FISHER ST	FROM LOCUST ST RUTLAND ST (RIGHT SIDE)	TURN AROUND
LOCUST ST	FROM FISHER ST TO CENTRAL AVE (RIGHT SIDE)	
TRAKEY ST	FROM CENTRAL AVE TO LOCUST ST (RIGHT SIDE)	
COURT ST	FROM UNION ST TO CENTRAL AVE (RIGHT SIDE)	

SUPERVISOR COMMENTS

1]

2]

3]

CULVERTS AND WASHOUT AREAS

STREET and LOCATION		NOTES/COMMENTS
COCHECO ST	AT PSNH BUILDING	
PORTLAND AVE	NEAR RAVINE	
PORTLAND AVE	AT PORTLAND ST	
BROADWAY	ACROSS FROM RED'S	
BAKER ST	HOUSE #4	
BERRY BROOK	AT 6TH, HOUGH AND ASH ST	
FOURTH ST	NEAR KENNEDY CIRCLE	
BLACKWATER RD		
HORNE ST		
COUNTY FARM RD		
HEMLOCK CIR		
SIXTH ST RAVINE		
462 SIXTH ST	ALONG EDGE OF PAVEMENT	

EXTRA RUN HEAVY SNOW

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
CENTRAL AVE	STRAFFORD FARMS TO MAST RD and STARK AVE TO
	ELLIOTT ROSE CO. GREENHOUSE
RTE 16B	TO COLONIAL VILLAGE NORTH
RTE 16	TO PORTLAND GLASS
CHESTNUT ST	

SUPERVISOR COMMENTS

1]

2]

3]

4]

EXTRA RUN HEAVY SNOW

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
WOODLAND RD	
LONGMEADOW RD	
BEECH RD	
BIRCHWOOD PL	
ELLIOTT CIR	PUSH BACK SNOW
KEATING ST	
HAYES LN	
SHAMROCK LN	
RENAUD AVE	
SMITH RD	
CENTRAL AVE	
STARK AVE	
MAIN ST	
LOCUST ST	
SILVER ST	
ARCH ST	
WASHINGTON	FROM LOWER SQ TO WHITTIER ST
WHITTIER	FROM TOLEND TO GLENWOOD
FOURTH ST	

SUPERVISOR COMMENTS

1]

2]

3]

4]

EXTRA RUN HEAVY SNOW

EQUIPMENT: DRIVER:

ROUTE	NOTES/COMMENTS
PORTLAND ST	
PORTLAND AVE	
MAIN ST	
FOURTH ST	
WASHINGTON ST	
WHITTIER ST	
SILVER ST	
DURHAM RD	
LOCUST ST	
CHESTNUT ST	

SUPERVISOR COMMENTS
1] CHECK BROADWAY
2]
3]
4]

CHURCHES -- SIDEWALK MAINTENANCE

EQUIPMENT: DRIVER:

STREET LOCATION	CHURCH NAME	NOTES/COMMENTS
CENTRAL AVE	FIRST PARISH	
CENTRAL AVE	ST. JOSEPH'S	
CENTRAL AVE	ST. CHARLES	
CHESTNUT & THIRD	ST. MARY'S	
FOURTH & GROVE	TEMPLE ISRAEL	
LOCUST ST	GREEK ORTHODOX	
PORTLAND AVE & MECHANIC	ST. GEORGE MARONIT	
WASHINGTON	DOVER BAPTIST	

SUPERVISOR COMMENTS

1]

2]

3]

4]

BRIDGES -- CITY MAINTAINED

BRIDGES FREEZE BEFORE ROADS

EQUIPMENT: DRIVER:

BRIDGE NAME and LOCATION	NOTES/COMMENTS
BELLAMY ROAD	
CATARACT AVE.	
CENTRAL AVE.	
CHESTNUT ST.	
FOURTH ST.	
GLENWOOD AVE. over TP	
SAWYER'S BRIDGE	
SPUR RD. over TP	
SIXTH ST. over TP	
TOLEND RD.	
WASHINGTON ST.	
WATSON RD.	
WHITTIER ST.	

SUPERVISOR COMMENTS
1]
2]
3]
4]

NORTH SIDE CATCH BASINS

EQUIPMENT: DRIVER:

STREET and LOCATION		NOTES/COMMENTS
CENTRAL AVE	AT TASKER FUNERAL HOME	
CENTRAL AVE	NEAR FRIENDLY MARKET	
CENTRAL AVE	ACROSS FROM SHOP&SAVE ENT	
GLENWOOD AVE	NEAR CENTRAL	
OAK ST	AT PARK ST	
OAK ST	AT BROADWAY	
PEARL ST	AT CHURCH	
HILL ST	NEAR #9	
E. CONCORD ST	NEAR #5	
BAKER ST	NEAR HYDRANT	
PARK ST	AT HAM	
NEW YORK ST	AT PARK	
BROADWAY	AT RED'S SHOE BARN	
BROADWAY	AT PIERCE	
PORTLAND AVE	IN "HOLLOW"	
ATLANTIC AVE	AT PORTLAND AVE.	
PORTLAND AVE	NEAR SPINELLI'S APTS.	
COCHECO ST	NEAR #108	
COUNTRY CLUB EST		
MT. VERNON ST	BEHIND CHURCH	
MT. VERNON ST	BETWEEN HOUGH & ASH	
MT VERNON ST	AT ASH ST	
ROOSEVELT ST	NEAR HORNE	
HORNE ST	NEAR ASH ST EXT	
SIXTH ST	AT HORNE ST	
SIXTH ST	NEAR EAST COAST AUTO BODY	
MAPLE ST	NEAR HOUGH ST	
GROVE ST	NEAR HOUGH ST	
CHESTNUT ST	NEAR FIFTH ST	
CHESTNUT ST	AT FOURTH ST	
FOURTH ST	NEAR SNOWS CT	

SOUTH SIDE CATCH BASINS

EQUIPMENT: DRIVER:

STREET and LOCATION	NOTES/COMMENTS
PLEASANT VIEW CIR	
WASHINGTON ST	
ARCH ST	
LEXINGTON ST	
LEXINGTON ST	
TOWLE AVE	
CUSHING ST	
LOCUST ST	
ST. THOMAS	
KIRKLAND ST	
LOCUST ST	
FISHER ST	
LOCUST ST	
BELLAMY RD	
LISA BETH CIRCLE	
DURHAM RD	
BACK RIVER RD	
BACK RIVER RD	
SHADOW DR	
LINDA DR	
AUSTIN DR	
MORNINGSIDE DR	
RIVERDALE DR	
KELLEY DR	
SPRUCE DR	
SPRUCE LN	
SPRUCE LN	
WESTWOOD CIR	